Hydro Smart 120 Condensing Gas Micro Boiler Installation Manual and Owner's Guide

ANSI Z21.10.3 and CSA 4.3

Models

- **HS120CON-LP (Liquid propane)**
- **HS120CON-NG (Natural gas)**

The **Hydro Smart 120 Condensing Gas Micro-Boiler is a compact and powerful residential unit with a versatile BTU modulating range.**

Please refer to local codes for space-heating compliance.

WARNING

If the information in these instructions is not followed exactly, a fire or explosion may result causing property damage, personal injury or death.

- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
- WHAT TO DO IF YOU SMELL GAS
  - Do not try to light any appliance.
  - Do not touch any electric switch, do not use any phone in your building.
  - Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
  - If you cannot reach your gas supplier, call the fire department.
- Installation and service must be performed by a qualified installer, service agency or the gas supplier.

FEATURING

- EFFICENCY: 93%
- TEMP RANGE: 99°-140°F
- COMPACT, SPACE SAVING
- FLOW ACTIVATED: .75 GPM
- COMPUTERIZED SAFETY
- NO PILOT LIGHT
- Satisfies the 2012 SCAQMD Rule 1146.2 for Ultra-Low NOx Emissions

If you have any questions, please call or write to:
10725 165th Ave NW
Elk River, MN 55330
1-763-331-3066

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NOTICE

- **This installation manual is approved for installation in the United States.**

Installation Manual

CONGRATULATIONS

Congratulations and thank you for choosing our condensing micro-boiler. Before use, we recommend that you read through this safety manual carefully. Please refer to the back of the manual for details about the warranty. Keep this manual for future reference.

If you lose the manual, contact the manufacturer or your local distributor. When you call, please tell us the model number and the serial number of your unit written on the rating plate of the micro-boiler.

SPECIFICATIONS

Hydro Smart Gas Condensing Micro-Boiler				
Natural Gas Input (Operating Range)		BTU/h	Min.: 15,000 Max.: 120,000	
Propane Input (Operating Range)		BTU/h	Min.: 15,000 Max.: 120,000	
Gas Connection			1/2" NPT	
Water Connection			3/4" NPT	
Water Pressure*		psi (MPa)	15 - 150 (0.1 - 1.0)	
Natural gas Inlet Pressure		inch W.C. (kPa)	Min. 5.0 (1.2) Max. 10.5 (2.6)	
Propane Inlet Pressure		inch W.C. (kPa)	Min. 8.0 (2.0) Max. 14.0 (3.5)	
Manifold Pressure**	Natural Gas	inch W.C. (Pa)	3.30 (820)	2.00 (500)
	Propane	inch W.C. (Pa)	3.00 (750)	1.60 (400)
Weight		lbs. (kg)	58 (22.5)	58 (22.5)
Dimension		inch	H 21-3/4 x W 14 x D 9-1/4 H 552 x W 352 x D 236	
		mm		
Ignition			Electric Ignition	
Electric	Supply	VAC / Hz	120 / 60	
	Consumption – Operation	W / A	53.9 / 0.7	
	Consumption – Standby	W / A	3.2 / 0.05	
	Consumption – Freeze-Protection	W / A	223.9 / 1.94	

*40 psi (0.27 MPa) or above is recommended for maximum flow.

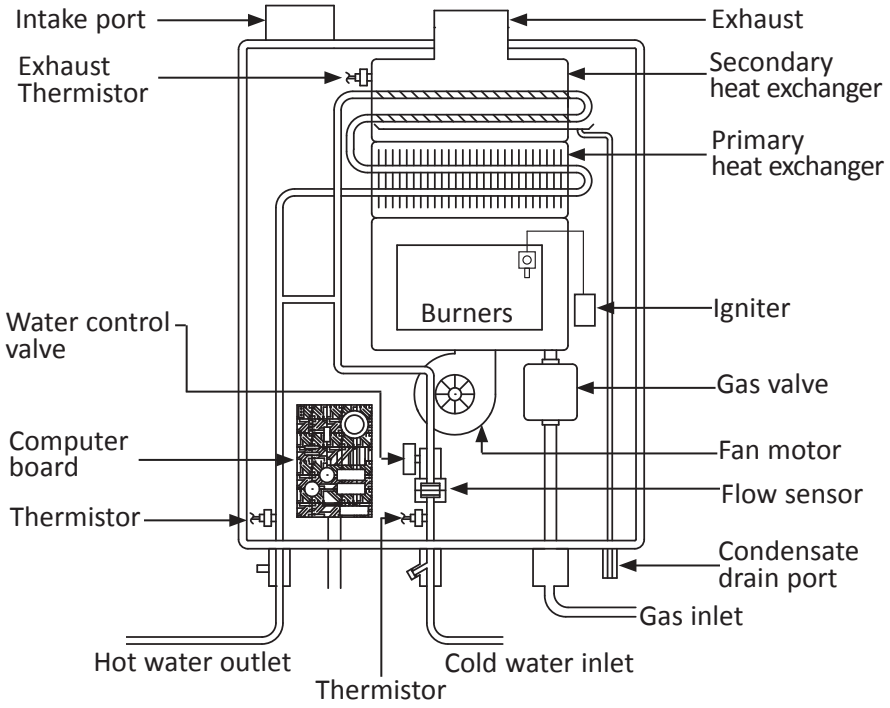
** The Manifold Pressure is the factory setting and **should not need adjustment**.

NOTE:

- Check the rating plate to ensure this product matches your specifications.
- In accordance with ANSI Z21.10.3, CO emission does not exceed 400 PPM for normal input.
- **The manufacturer reserves the right to discontinue, or change at any time, specifications or designs without notice and without incurring obligation.**

INTRODUCTION

- This manual provides information necessary for the installation, operation, and maintenance of the micro-boiler.
- The model description is listed on the rating plate which is attached to the side panel of the micro-boiler.
- Please read all installation instructions completely before installing this product.
- If you have any problems or questions regarding this equipment, consult the manufacturer or its local representative.
- These **high efficiency models** have a built-in secondary heat exchanger that absorbs latent heat from the exhaust gas.
- The 140 Indoor (T-H3M-DV) model is only to be installed indoors. The 140 Outdoor (T-H3M-OS) model is only to be installed outdoors.
- The principle behind condensing micro-boiler is simple:



*This diagram illustrates condensing micro-boiler design concepts only and does not accurately represent the micro-boiler's physical description.

1. Your thermostat indicates a need for heat and turns on a circulator pump.
2. Fluid enters the heater.
3. The flow sensor detects the fluid flow.
4. The computer initiates the fan motor and sends a signal to the igniter to create an ignition spark.
5. The gas ignites and flames appear within the burner chamber.
6. Fluid circulates through the heat exchanger and then gets hot.
7. Using thermistors to measure temperatures throughout the micro-boiler, the computer modulates the gas and water valves to ensure proper output fluid temperature.
8. Your room reaches desired temperature and the micro-boiler shuts off.

SAFETY GUIDELINES

SAFETY DEFINITION

DANGER Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING Indicates an imminently hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION Indicates an imminently hazardous situation which, if not avoided, could result in minor or moderate injury.

GENERAL

1. Follow all local codes, or in the absence of local codes, follow the most recent edition of the National Fuel Gas Code: ANSI Z223.1/NFPA 54 in the USA or CAN/CSA B149.1 Natural Gas, Propane Installation Code in Canada.
2. Properly ground the micro-boiler in accordance with all local codes or in the absence of local codes, with the National Electrical Codes: ANSI/NFPA 70 in the USA or CSA standard C22.1 Canada Electrical Code Part 1 in Canada.
3. Carefully plan where you intend to install the micro-boiler. Please ensure:
   - Your micro-boiler will have enough combustible air and proper ventilation.
   - Locate your boiler where fluid leakage will not damage surrounding areas (please refer to p. 8).
4. Check the rating plate for the correct **GAS TYPE, GAS PRESSURE, FLUID PRESSURE and ELECTRIC RATING**.
   *If this micro-boiler does not match your requirements, **do not install and consult with the manufacturer**.
5. If any problem should occur, turn off all thermostats and turn off the gas. Then call a trained technician or the Gas Company or the manufacturer.

WARNING

- Do not store or use gasoline or other flammables, vapors, or liquids in the vicinity of this appliance.
- Do not reverse the fluid and/or gas connections as this will damage the gas valves and can cause severe injury or death. Follow the diagram on p. 22 when installing your micro-boiler.
- Do not use this micro-boiler if any part has been in contact with or been immersed in water. Immediately call a licensed plumber, a licensed gas fitter, or a professional service technician to inspect and/or service the micro-boiler if necessary.
- Do not disconnect the electrical supply if the ambient temperature will drop below freezing. The Freeze Protection System only works if the micro-boiler has electrical power. The heat exchanger will not be covered under warranty if it is damaged due to freezing. Refer to the section on the Freeze Protection System on p. 40 for more information.

INSTALLATION

GENERAL

1. Follow all local codes, or in the absence of local codes, follow the most recent edition of the National Fuel Gas Code: ANSI Z223.1/NFPA 54 in the USA or CAN/CSA B149.1 Natural Gas, Propane Installation Code in Canada.

2. All gas micro-boilers require careful and correct installation to ensure safe and efficient operation. This manual must be followed exactly. Read the “Safety Guidelines” section.

3. The manifold gas pressure is preset at the factory. It is computer controlled and should not need adjustment.

4. Maintain proper space for servicing. Install the micro-boiler so that it can be connected or removed easily. Refer to the "Clearances" section on p. 9 for proper clearances.

5. The micro-boiler must be installed in a location where the proper amount of combustible air will be available to it at all times without obstructions.

6. The electrical connection requires a means of disconnection, to terminate power to the micro-boiler for servicing and safety purposes.

7. Do not install the micro-boiler where the exhaust vent is pointing into any opening in a building or where the noise may disturb your neighbors. Make sure the vent termination meets the required distance by local code from any doorway or opening to prevent exhaust from entering a building (refer to p. 17 to 19).

8. Particles from flour, aerosols, clothes dryers and other airborne contaminants may clog the air vent, build up and reduce the functions of the rotating fan, cause improper burning of the gas, or cause damage to the micro-boiler. Regularly ensure that the area around the micro-boiler is dust- or debris-free. Regular maintenance is recommended for these types of environments. Sealed combustion is recommended too.

9. The Hydro Smart 120 micro-boiler is to be installed indoors only. The model is equipped with a thermistor and hi-limit switch for the exhaust gas, detecting excess temperatures within the flue and enabling the micro-boiler to safely stop operation if needed. These components are always monitoring exhaust gas conditions in order to prevent heat damage to ABS, PVC, CPVC, or Polypropylene (Plastic) venting if ABS, PVC, CPVC, or Polypropylene is used. If the exhaust gas temperature exceeds 140 °F (60 °C) these components will enable the micro-boiler to safely stop operation.
    - The micro-boiler requires 3 inch, or 4 inch diameter intake air supply pipe. The intake pipe must be sealed airtight.
    - Air supply pipe can be made of aluminum flexible tube, ABS, PVC, CPVC, Polypropylene, corrugated stainless steel, or Category lll / IV stainless steel. Regarding exhaust pipe, please refer to p.11 for detailed information.
    - Sidewall venting is recommended for this boiler. Vertical venting (roof termination) is acceptable.
    - The manufacturer recommends running the exhaust vent and the intake pipe as parallel as possible.

WARNING

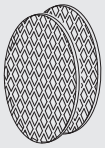
- **Installation and service must be performed by a qualified installer (for example, a licensed plumber or gas fitter), otherwise the warranty will be void.**
- **The installer (licensed professional) is responsible for the correct installation of the micro-boiler and for compliance with all national, state/provincial, and local codes.**
- **The manufacturer does not recommend installing the micro-boiler in a pit or location where gas and water can accumulate.**
- Do not have the vent terminal pointing toward any operating window, door, or opening into a building.
- Do not install the micro-boiler next to any source of airborne debris, such as a clothes dryer and a vent that can cause debris to be trapped inside the combustion chamber, unless the system is direct-vented.
- **The manufacturer does not recommend installing the micro-boiler in an attic due to safety issues.** If you install the micro-boiler in an attic:
  - Make sure the micro-boiler will have enough combustion air and proper ventilation.
  - Keep the area around the micro-boiler clean. When dust collects on the flame sensor, the micro-boiler will shut down on an error code.
  - Place the micro-boiler in a location that provides easy access for service and maintenance.
  - A drain pan, or other means of protection against water damage, is required to be installed under the micro-boiler in case of leaks.
  - It is recommended to direct vent the heater.

CAUTION

- **Damage caused by water quality is not covered by the warranty.**
  - Only potable water or potable water / glycol mixtures can be used with this micro-boiler. Do not introduce pool or spa water, or any chemically treated water into the micro-boiler.
  - Water hardness levels must not exceed 7 grains per gallon (120 ppm) for single family domestic applications or more than 4 grains per gallon (70 ppm) for all other types of applications. Water hardness leads to scale formation and may affect / damage the micro-boiler. Hard water scaling must be avoided or controlled by proper water treatment.
  - Water pH levels must be between 6.5 and 8.5
  - Well water must be treated.
- Do not install the micro-boiler where water, debris, or flammable vapors may get into the flue terminal.
- Although the micro-boiler is designed to operate with minimal sound, **the manufacturer does not recommend installing the micro-boiler on a wall adjacent to a bedroom, or a room that is intended for quiet study or meditation, etc**.
- Locate your boiler close to a drain where water leakage will not do damage to surrounding areas. As with any fluid heating appliance, the potential for leakage at some time in the life of the product does exist. The manufacturer will not be responsible for any water damage that may occur. If you install a drain pan under the micro-boiler, ensure that it will not restrict the combustion air flow .

INCLUDED ACCESSORIES

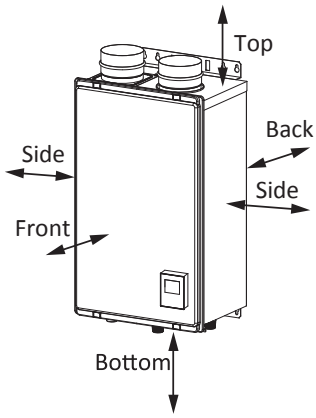
Check that these items below are included with the micro-boiler.

Installation Manual and Owner's Guide	Bird Screen Indoor model only
Qty: 1	 Qty: 2

*For more information on optional items, please refer to p.32 to 33.

CLEARANCES

Maintain all clearances around the micro-boiler.



Model	Top	Bottom	Front	Back	Sides
HS120Con-LP (Liquid propane)	12 in. (305 mm)	12 in. (305 mm)	4 in.* (102 mm)	1 in. (25 mm)	3 in. (76 mm)
HS120Con-NG (Natural Gas)	12 in. (305 mm)	12 in. (305 mm)	4 in.* (102 mm)	1 in. (25 mm)	3 in. (76 mm)

*24 inches recommended for maintenance

VENTING INSTRUCTIONS

For the 140 Indoor (T-H3M-DV) model

-General-

DANGER

- Improper venting of this appliance can result in excessive levels of carbon monoxide which can result in severe personal injury or death.
- Improper installation can cause nausea or asphyxiation, severe injury or death from carbon monoxide and flue gases poisoning. Improper installation will void product warranty.

CAUTION

When installing the vent system, all applicable national and local codes must be followed. If you install thimbles, fire stops or other protective devices and they penetrate any combustible or noncombustible construction, be sure to follow all applicable national and local codes.

The micro-boiler must be vented in accordance with the section “Venting of Equipment" of the latest edition of the National Fuel Gas Code: ANSI Z223.1/NFPA 54 in the United States and/or Section 7 of the CAN/CSA B149.1 Natural Gas and Propane Installation Code in Canada, as well as applicable local building codes.

The use of venting materials approved for Category III/IV appliances is recommended whenever possible. However, the micro-boiler may also be vented with plastic pipe materials such as ABS, PVC, CPVC, or Polypropylene. **For details, please refer to the Exhaust Vent (ABS, PVC, CPVC, or Polypropylene Vent) section on p. 11.** Vent installations in Canada which utilize plastic vent systems must use venting that complies with ULC S636.

General rules for venting micro-boiler are:

- Place the micro-boiler as close as possible to the vent termination.
- The vent collar of the micro-boiler must be fastened directly to an unobstructed vent pipe.
- Do not weld the vent pipe to the micro-boiler’s vent collar.
- Do not cut or alter the vent collar of the micro-boiler.
- The vent must be easily removable from the top of the micro-boiler for normal service and inspection of the unit.
- Avoid using an oversized vent pipe or using extremely long runs of the pipe.
- For rooftop venting, a rain cap or other form of termination that prevents rain water from entering into the micro-boiler must be installed.
- Do not terminate the vent into a chimney. If the vent must go through the chimney, the vent must run all the way through the chimney with approved vent pipe.

General rules for vent terminations:

- Avoid locating the micro-boiler vent termination near **any air intake devices**. These fans can pick up the exhaust flue products from the micro-boiler and return them to the building. This can create a health hazard.
- Locate the vent termination so that it cannot be blocked by any debris, at any time. Most codes require that the termination be at least 12 inches (305 mm) above grade, but the installer may determine if it should be higher depending on the job site condition and applicable codes.
- A proper sidewall termination is recommended when the micro-boiler is vented through a sidewall.
- Regarding the clearances from the exhaust termination to the air inlet or opening, refer to p. 17 to 19.

-Exhaust vent (ABS, PVC, CPVC, or polypropylene vent)-

The micro-boiler can be vented with ABS, PVC, CPVC, or polypropylene (temperature rated up to at least 149 °F). Vent material certified to ULC S636 standards is recommended in the USA. In Canada, plastic venting must be certified to ULC S636 standards.

Item	Material	United States	Canada
Exhaust pipe and Fittings	Schedule 40 PVC	ANSI/ASTM D1785	ULC S636 Certified Materials Only
	PVC-DWV	ANSI/ASTM D2665	
	Schedule 40 CPVC	ANSI/ASTM F441	
	Schedule 40 ABS-DWV	ANSI/ASTM D2661	
	Polypropylene	UL-1738	
Pipe Cement/Primer	PVC	ANSI/ASTM D2564	
	CPVC	ANSI/ASTM F493	
	ABS	ANSI/ASTM D2235	
NOTE: Do NOT Use Cellular Foam Core Pipe			

- The maximum length of exhaust vent piping must not exceed 70 ft. (21.3 m) for 3" venting, which depends on the elevation where the micro-boiler is installed, and 100 ft. (30.5 m) for 4" venting (deducting 5 ft. (1.5 m) for each elbow used in the venting system). Do not use more than 5 elbows. See the table below.
- When the horizontal vent run exceeds 5 ft. (1.5 m), support the vent run at 3 ft. (0.9 m) intervals with overhead hangers.

Max. Vertical or Horizontal (Total) Vent Lengh

No. of Elbow	2" venting	3" venting			4" venting
	Up to 3,000 ft	Up to 3,000 ft	Up to 6,000 ft	Up to 10,100 ft	Up to 10,100 ft
0	6.5 ft. (2.0 m)	70 ft. (21.3 m)	40 ft. (12.2 m)	25 ft. (7.6 m)	100 ft. (30.5 m)
1	1.5 ft. (0.5 m)	65 ft. (19.8 m)	35 ft. (10.7 m)	20 ft. (6.1 m)	95 ft. (29.0 m)
2	N/A	60 ft. (18.3 m)	30 ft. (9.1 m)	15 ft. (4.6 m)	90 ft. (27.4 m)
3	N/A	55 ft. (16.8 m)	25 ft. (7.6 m)	10 ft. (3.0 m)	85 ft. (25.9 m)
4	N/A	50 ft. (15.2 m)	20 ft. (6.1 m)	5 ft. (1.5 m)	80 ft. (24.4 m)
5	N/A	45 ft. (13.7 m)	N/A	N/A	75 ft. (22.9 m)

Excludes vent terminators, termination elbows, or rain caps.

For details on the vent connection, refer to p. 13 to 16.

***For each elbow added, deduct 5 ft. (1.5 m) from max. vent length.**

-DIPswitch settings for Vent length-

Set DIPswitches shown in the tables below depending on the vent length. Only adjust switches with a black square. Black squares indicate the position of the switch.

2 inch venting

Vent length	Single pipe
5 to 6.5 ft.	 No. 6 : ON No. 7 : ON

3 inch venting

Vent length	Two-pipe
5 to 20 ft. (DEFAULT)	 No. 6 : ON No. 7 : OFF
21 to 40 ft.	 No. 6 : OFF No. 7 : OFF
41 to 70 ft.	 No. 6 : ON No. 7 : ON

Vent length	Single pipe
5 to 45 ft. (DEFAULT)	 No. 6 : ON No. 7 : OFF
46 to 70 ft.	 No. 6 : OFF No. 7 : OFF

4 inch venting

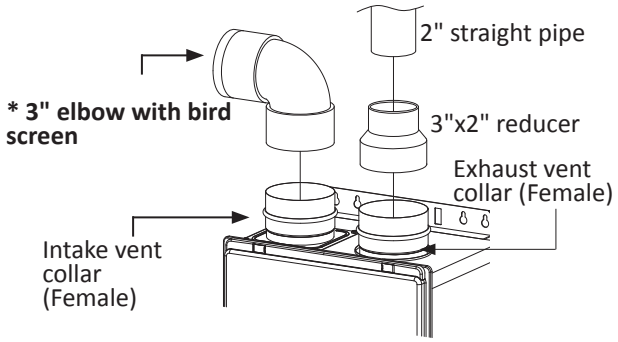
Vent length	Two-pipe and Single pipe
5 to 50 ft. (DEFAULT)	 No. 6 : ON No. 7 : OFF
51 to 100 ft.	 No. 6 : OFF No. 7 : OFF

-Intake and Exhaust Venting Illustrations-

Typical installations using <u>ABS, PVC, CPVC, or polypropylene vent</u>

2 inch vent installation

Vent connections for single pipe

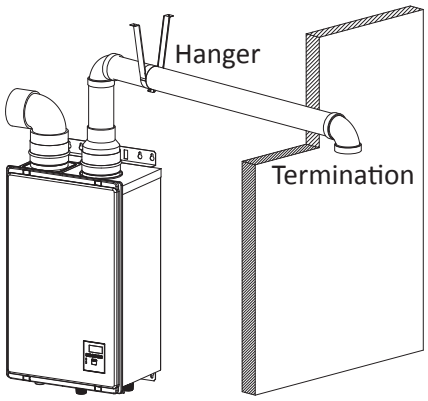


*The micro-boiler came with a metal screen that will fit into a 3 inch elbow.

1. Connect a 3" elbow directly on the intake vent collar of the micro-boiler.
2. Connect a 3" x 2" reducer directly on the exhaust vent collar of the micro-boiler.
   Make sure the couplings engage the o-rings installed in the intake and exhaust vent collars
3. Connect a 2" straight pipe to the reducer.

For details of the optional items, refer to the Installation manual for each optional item.

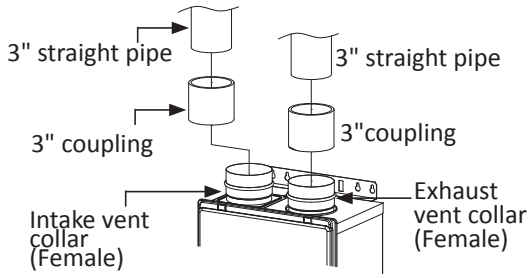
Single pipe with room-air intake



Refer to pages 17 and 19 for clearance information

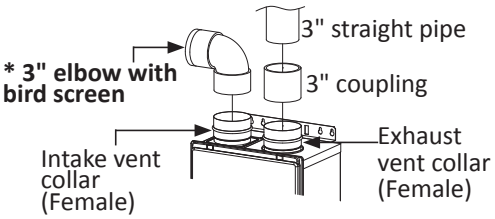
3 inch vent installation

Vent connections for two-pipe



1. Connect 3" couplings directly on the exhaust and intake vent collar of the micro-boiler.
   Make sure the couplings engage the o-rings installed in the intake and exhaust vent collars
2. Connect 3" straight pipes to the couplings.

Vent connections for single pipe



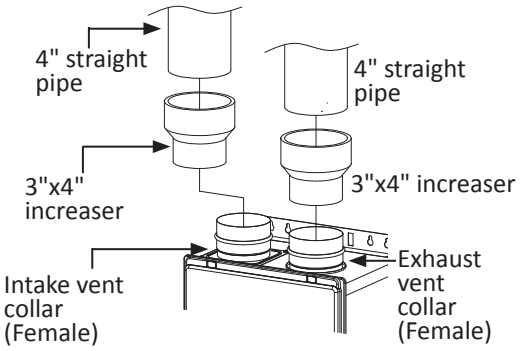
*The micro-boiler came with a metal screen that will fit into a 3 inch elbow.

1. Connect a 3" elbow directly on the intake vent collar of the micro-boiler.
2. Connect a 3" coupling directly on the exhaust vent collar of the micro-boiler.
   Make sure the couplings engage the o-rings installed in the intake and exhaust vent collars
3. Connect a 3" straight pipe to the coupling.

For details of the optional items, refer to the Installation manual for each optional item.

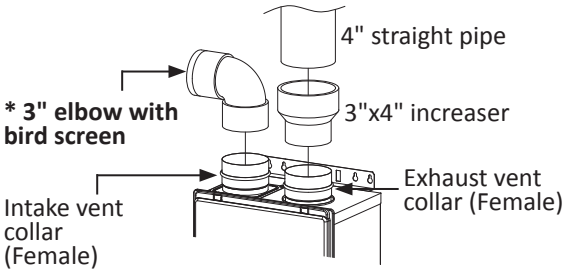
4 inch vent installation

Vent connections for two-pipe



1. Connect 3"x 4" increasers directly on the exhaust and intake vent collar of the micro-boiler.
   Make sure the couplings engage the o-rings installed in the intake and exhaust vent collars
2. Connect 4" straight pipes to the increasers.

Vent connections for single pipe



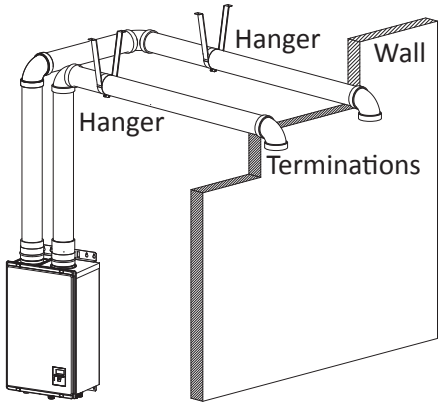
*The micro-boiler came with a metal screen that will fit into a 3 inch elbow.

1. Connect a 3" elbow directly on the intake vent collar of the micro-boiler.
2. Connect a 3"x 4" increaser directly on the exhaust vent collar of the micro-boiler.
   Make sure the couplings engage the o-rings installed in the intake and exhaust vent collars
3. Connect a 4" straight pipe to the increaser.

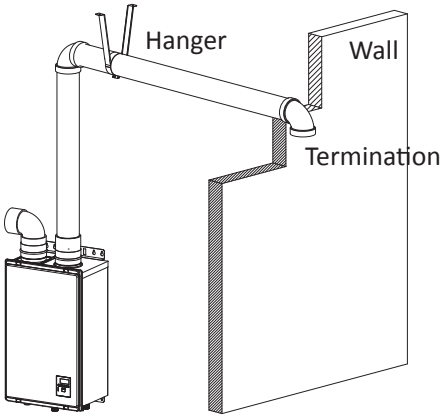
For details of the optional items, refer to the Installation manual for each optional item.

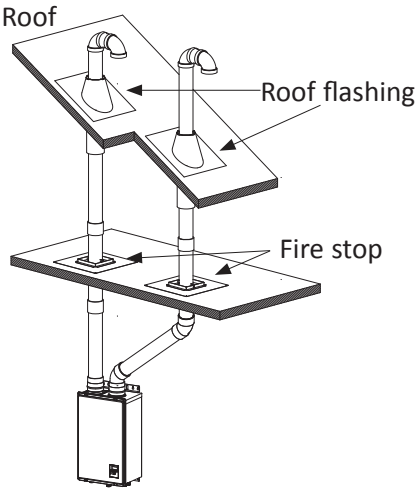
Examples of installation of 3 inch & 4 inch vent

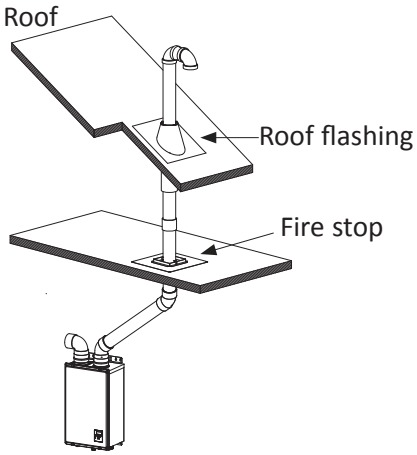
Two-pipe, direct-vent



Single pipe with room-air intake







Refer to pages 17 and 19 for clearance information

-Exhaust vent (Stainless steel vent)-

This is a Category IV appliance and must be vented accordingly. The vent system must be sealed airtight. All seams and joints **without gaskets** must be sealed with high heat resistant silicone sealant or UL listed aluminum adhesive tape having a minimum temperature rating of 160 °F. For best results, a vent system should be as short and straight as possible.

- The micro-boiler is a Category IV appliance and must be vented accordingly with any 4 inch vent approved for use with Category III/IV or Special BH type gas vent.
- **The manufacturer recommends the NovaVent (Z-Vent) line**. However, the following are also UL listed manufacturers: ProTech Systems Inc. (FasNSeal), Metal-Fab Inc., and Heat-Fab Inc. (Saf-T Vent).
- **Follow the vent pipe manufacturer's instructions when installing the vent pipe.**
- The maximum length of exhaust vent piping must not exceed 100 ft. (30.5 m) (deducting 5 ft. (1.5 m) for each elbow used in the venting system). Do not use more than 5 elbows.
- When the horizontal vent run exceeds 5 ft. (1.5 m), support the vent run at 3 ft. (0.9 m) intervals with overhead hangers.

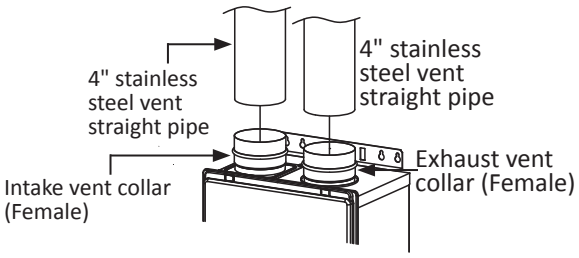
Diameter	Max. No. of Elbows	Max. Vertical and Horizontal (Total) Vent Length
4 in. (102 mm)	5	100 ft. (30.5 m)

***For each elbow added, deduct 5 ft. (1.5 m) from max. vent length.**

No. of Elbows	Max. Vertical or Horizontal Vent Length
0	100 ft. (30.5 m)
1	95 ft. (29.0 m)
2	90 ft. (27.4 m)
3	85 ft. (25.9 m)
4	80 ft. (24.4 m)
5	75 ft. (22.9 m)

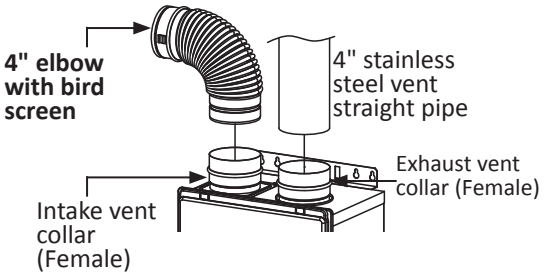
Excludes vent terminators, termination elbows, or rain caps.

Vent connections for two-pipe


4" stainless steel vent straight pipe
4" stainless steel vent straight pipe
Exhaust vent collar (Female)
Intake vent collar (Female)

1. Connect 4" stainless steel vent straight pipes directly on the exhaust/intake vent collar of the micro-boiler.

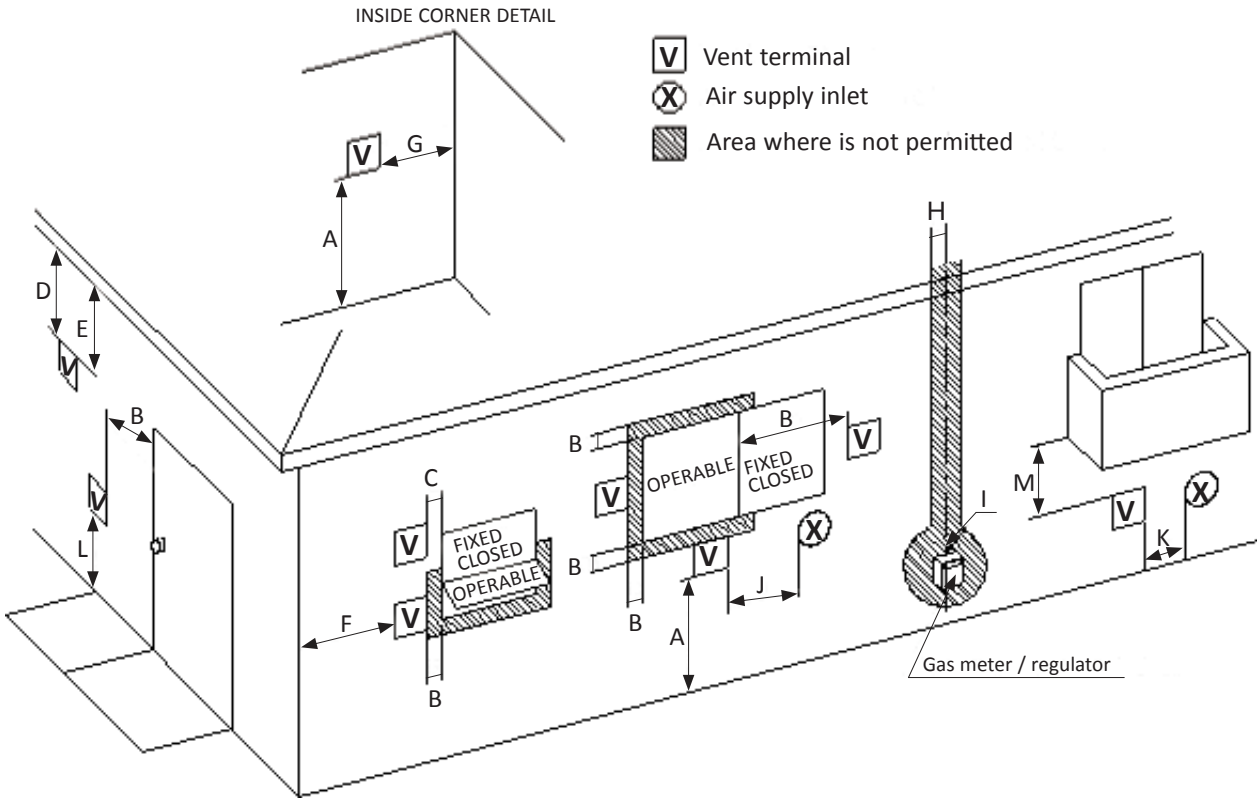
Vent connections for single pipe



1. Connect a 4" stainless steel vent straight pipes directly on the exhaust vent collar of the micro-boiler.
2. Connect a 4" elbow directly on the intake vent collar of the micro-boiler.

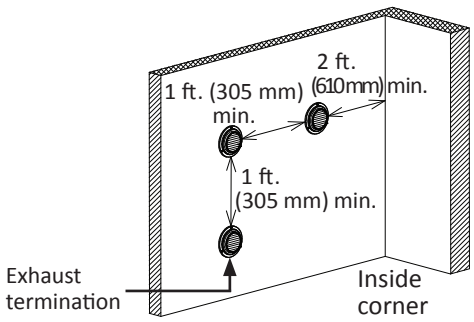
For details of the optional items, refer to the Installation manual for each Optional item.

-Vent termination clearances-

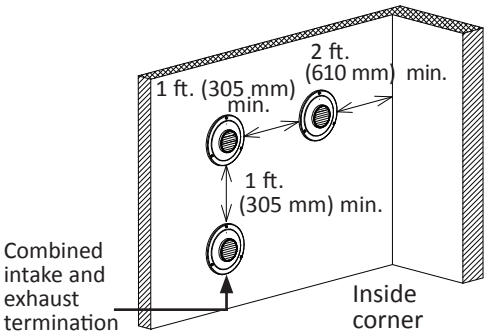


		Canada	U.S.A	
		Direct-vent and other than Direct-vent	Direct-vent	Other than Direct-vent
A	Clearance above grade, veranda, porch, deck, or balcony	1 foot	1 foot	1 foot
B	Clearance to window or door that may be opened	3 feet	1 foot	4 feet from below or side opening. 1 foot from above opening
C	Clearance to permanently closed window	*	*	*
D	Vertical clearance to ventilated soffit located above the vent terminator within a horizontal distance of 2 feet (61cm) from the center line of the terminator	*	*	*
E	Clearance to unventilated soffit	*	*	*
F	Clearance to outside corner	*	*	*
G	Clearance to inside corner	*	*	*
H	Clearance to each side of center line extended above meter/regulator assembly	3 feet	*	*
I	Clearance to service regulator vent outlet	3 feet	*	*
J	Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other application	3 feet	1 foot	4 feet from below or side opening. 1 foot from above opening
K	Clearance to mechanical air supply inlet	6 feet	3 feet	3 feet
L	Clearance above paved sidewalk or paved driveway located on public property	7 feet	*	7 feet
M	Clearance under veranda, porch deck, or balcony	1 foot	*	*

*For clearances not specified in ANSI Z223.1 / NFPA 54 or CAN/CSA-B149.1, please use clearances in accordance with local installation codes and the requirements of the gas supplier.



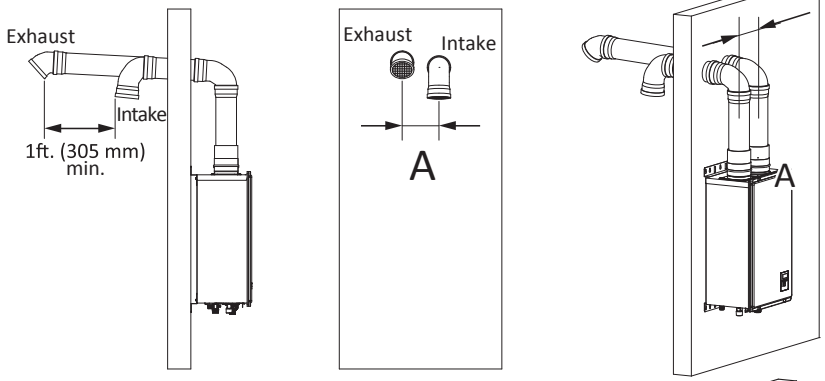
For multiple sidewall exhaust terminations, an exhaust termination must be at least 1 ft. (305mm) away from another exhaust termination. An exhaust termination must also be at least 2 ft. (610 mm) away from an inside corner. (If the adjacent wall is less than 2 ft. (610 mm) of length, the minimum required distance away from the inside corner will be equal to the length of that adjacent wall.)



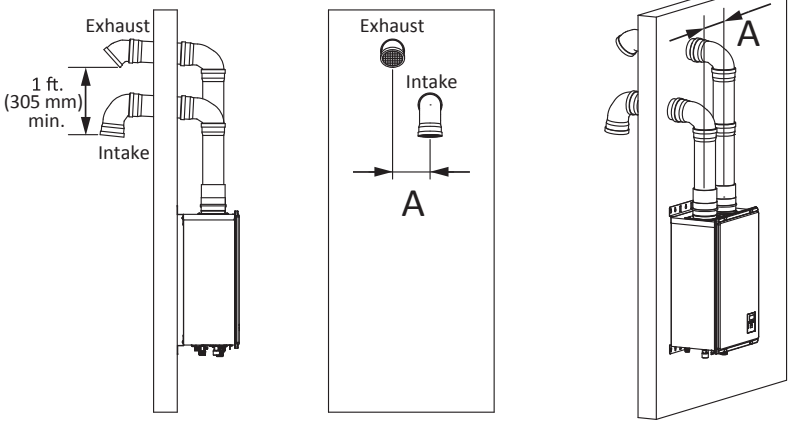
For multiple, direct-vent sidewall terminations that combine the intake and exhaust into a single penetration, space each direct-vent termination at least 1 ft. (305 mm) away from each other, no matter the orientation. A direct-vent termination must also be at least 2 ft. (610 mm) away from an inside corner. (If the adjacent wall is less than 2 ft. (610 mm) of length, the minimum required distance away from the inside corner will be equal to the length of that adjacent wall.)

<Case 1>

For direct-vent sidewall terminations that use two separate penetrations for the intake and exhaust, keep the termination clearances shown in the diagrams on the right.

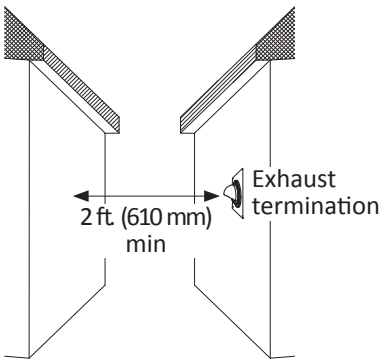


<Case 2>



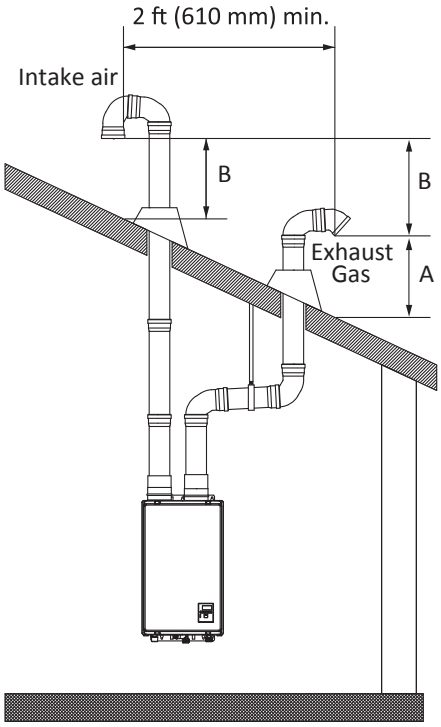
<u>* 3inch and 4 inch vent installations only</u>

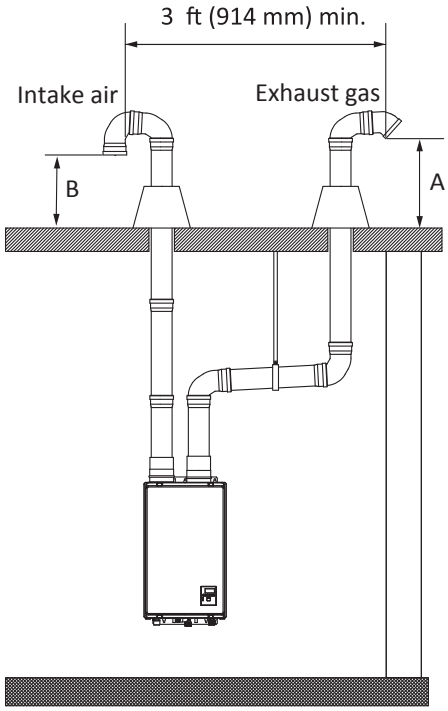
A: 0.5 ft. (159mm)
The clearance of A is recommended on the basis of the structure of the micro-boiler.



Exhaust and/or direct-vent sidewall terminations should be at least 2 ft. (610 mm) away from an opposite surface/ wall. Do not place the termination directly in front of an opening into a building.

<For rooftop terminations>





A:Exhaust terminations must be at least 1 ft. (305 mm) away from any obstructions.
B:Intake terminations must be at least 1 ft. (305 mm) away from any obstructions.

CAUTION

Please follow all local and national codes in regards to proper termination clearances. In the absence of such codes, the clearances above can be used as guidelines. Local codes supersede these guidelines.

GAS SUPPLY AND GAS PIPE SIZING

-General-

CAUTION

- **Check that the type of gas matches the rating plate first.**
- **Ensure that any and all gas regulators used are operating properly and providing gas pressures within the specified range shown below. Excess gas inlet pressure may cause serious accidents.**
- Conversion of this micro-boiler from natural gas to propane or vice versa will void all warranty. Contact your local distributor to get the correct unit for your gas type. **The manufacturer is not liable for any property and/or personal damage resulting from gas conversions**.

- The minimum and maximum inlet gas pressures are:

Gas type	Inlet gas pressure
Natural Gas	Min. 5.0” W.C. (1.24 kPa) – Max. 10.5” W.C. (2.61 kPa)
Propane	Min. 8.0” W.C. (1.99 kPa) – Max. 14.0” W.C. (3.48 kPa)

- Inlet gas pressures that fall outside the range of values listed above may adversely affect the performance of the micro-boiler. These pressures are measured when the micro-boiler is in full operation.
- Inlet gas pressure must not exceed the above maximum values; gas pressure above the specified range will cause dangerous operating conditions and damage to the micro-boiler.
- Until testing of the main gas line supply pressure is completed, ensure the gas line to the micro-boiler is disconnected to avoid any damage to the micro-boiler.

-Gas connections-

1. Install a manual gas shutoff valve between the micro-boiler and the gas supply line. The gas supply line shall be checked for leaks using code approved methods.
2. When the gas connections are completed, it is necessary to perform a gas leak test either by applying soapy water to all gas fittings and observing for bubbles or by using a gas leak detection device.
    - The micro-boiler and its individual shutoff valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of 1/2 psi (3.5 kPa).
    - The micro-boiler must be isolated from the gas supply piping system by closing its individual manual shutoff valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 1/2 psi (3.5 kPa).
3. Always purge the gas line of any debris and/or water before connecting to the gas inlet.

NOTICE

Size the gas pipe appropriately to supply the necessary volume of gas required for the micro-boiler using ANSI Z223.1/NFPA 54 in the USA or CAN/CSA B149.1 in Canada or local codes. Otherwise, flow capabilities and output temperatures will be limited.

-Natural Gas Supply Piping-

Maximum delivery Capacity of Cubic Feet of Gas per Hour of IPS Pipe carrying Natural Gas with 0.60 Specific Gravity Based on Pressure Drop of 0.5" W.C.

Based on Energy Content of 1,000 BTU/Cubic ft.: The micro-boiler requires 120 Cubic ft./hr

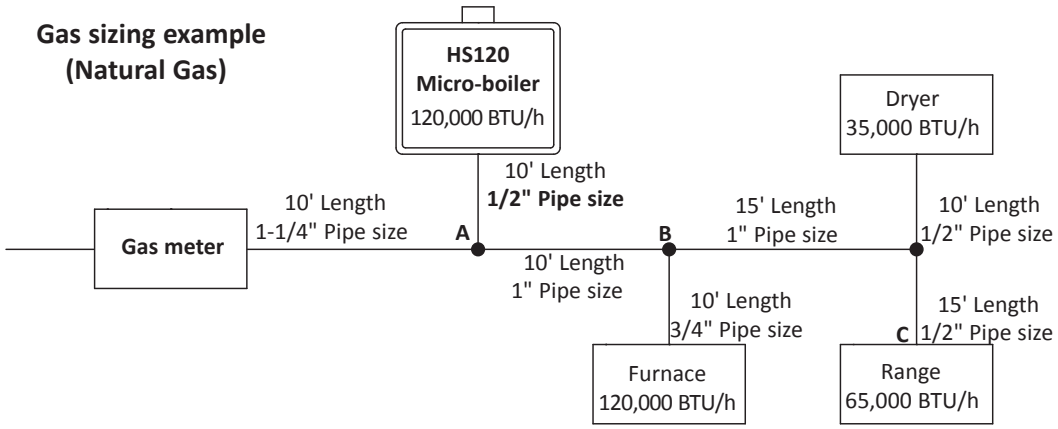
Unit: Cubic feet per hour

Pipe Size	Length												
Diameter	10'	20'	30'	40'	50'	60'	70'	80'	90'	100'	125'	150'	200'
1/2"	172	118											
3/4"	363	249	200	171	152	138	127	118					
1"	684	470	377	323	286	259	239	222	208	197	174	158	135
1 1/4"	1,404	965	775	663	588	532	490	456	428	404	358	324	278
1 1/2"	2,103	1,445	1,161	993	880	798	734	683	641	605	536	486	416
2"	4,050	2,784	2,235	1,913	1,696	1,536	1,413	1,315	1,234	1,165	1,033	936	801

-Propane (LP) Supply Piping-

Unit: kBTU per hour

Pipe Size	Length												
Diameter	10'	20'	30'	40'	50'	60'	70'	80'	90'	100'	125'	150'	200'
1/2"	268	184	148	126	112								
3/4"	567	393	315	267	237	217	196	185	173	162	146	132	112
1"	1,071	732	590	504	448	409	378	346	322	307	275	252	213
1 1/4"	2,205	1,496	1,212	1,039	913	834	771	724	677	630	567	511	440
1 1/2"	3,307	2,299	1,858	1,559	1,417	1,275	1,181	1,086	1,023	976	866	787	675
2"	6,221	4,331	3,465	2,992	2,646	2,394	2,205	2,047	1,921	1,811	1,606	1,496	1,260



Based on Energy Content of 1,000 BTU/Cubic ft:

Divide each appliance's BTU requirement by 1,000 BTU/h to get the appliances Cubic Ft. requirement.

Take into account the distance the appliance is from the gas meter, look in the above gas chart to properly size the line.

For sections of the gas line supplying gas to more than one appliance (Ex: Point A to Point B), add up the cubic ft. requirements of the appliances that are being supplied by that section, and size to the farthest appliance.

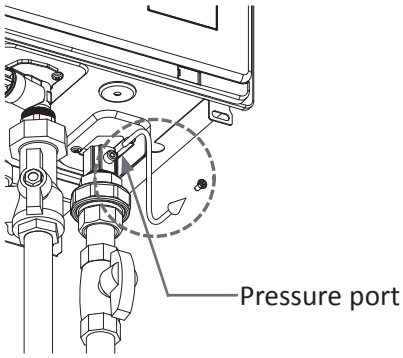
For Example: The section from A to B supplies gas to the furnace, range and dryer. Adding up the BTU requirements and dividing by 1,000 yields a cubic ft. requirement of 220 cubic ft. of gas. The farthest appliance is the range, which is 50 ft. away from the meter. Looking at the above chart, and under the column of 50 ft., Section A to B needs to be 1" in order to supply 220 cubic ft.

-Measuring inlet gas pressure-

1. Turn off all electric power to the micro-boiler if service is to be performed.
2. Turn the manual gas valve located on the outside of the micro-boiler clockwise to the off position.

The micro-boiler cannot perform properly without sufficient inlet gas pressure. Below are instructions on how to check the inlet gas pressure. **THIS IS ONLY TO BE DONE BY A LICENSED PROFESSIONAL**.

1. Shut off the manual gas valve on the gas supply line.
2. Remove the screw for the pressure port located on the gas inlet of the micro-boiler shown in the diagram on the right.
3. Connect the manometer to the pressure port.
4. Re-open the manual gas valve. Check to see that there are no gas leaks. Take a reading of the gas pressure. Open some of the fixtures that use the highest flow rate to turn on the micro-boiler.
5. Check the inlet gas pressure. Take another reading. When the micro-boiler is on maximum and minimum burn, the manometer should read from 5.0" to 10.5" W.C. (1.24 to 2.61 kPa) for Natural gas, or from 8.0" to 14.0" W.C. (1.99 to 3.48 kPa) for Propane. Verify that the pressure drop is acceptable.



WATER CONNECTIONS

CAUTION

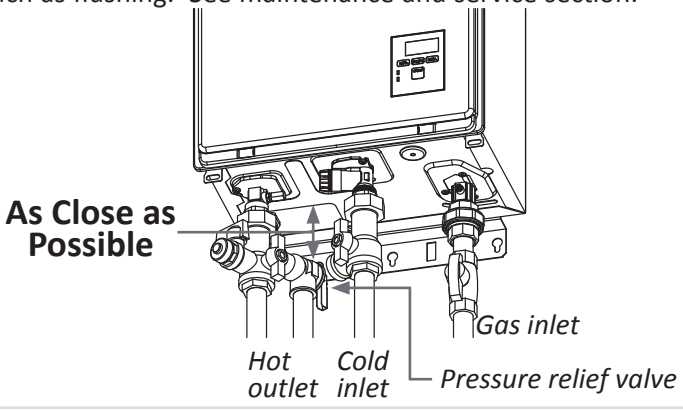
- Do not use this micro-boiler if any part has been submersed under water. Immediately call a licensed professional to inspect the micro-boiler to replace any damaged parts.
- Do not reverse the hot outlet and cold inlet connections to the micro-boiler. This will not properly activate the micro-boiler.

All pipes, pipe fittings, valves and other components, including soldering materials, must be suitable for space heating systems.

1. A manual shutoff valve must be installed on the cold water inlet to the micro-boiler between the main water supply line and the micro-boiler.

2. In addition, a manual shutoff valve is also recommended on the hot water outlet of the micro-boiler. If the micro-boiler is installed within, or subjected to, a closed loop water system, a thermal expansion tank or code approved device to handle thermal expansion must be installed. We recommend isolation valve sets with hose bibs for serviceability such as flushing. See maintenance and service section.

3. Before installing the micro-boiler, flush the system to remove all debris, and after installation is complete, purge the air from the line. Failure to do so may cause damage to the boiler.



-Pressure relief valve-

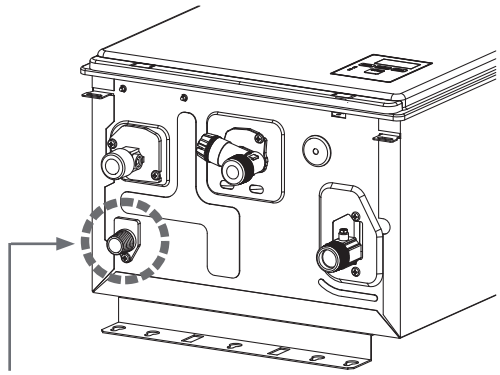
The micro-boiler has a high-temperature shutoff switch built in as a standard safety feature (called a Hi-Limit switch) therefore a **"pressure only"** relief valve is required.

- This micro-boiler does not come with an approved pressure relief valve.
- An approved pressure relief valve must be installed on the hot water outlet.
- The pressure relief valve must conform to **ANSI Z21.22** or **CAN 1-4.4** and installation must follow local codes.
- The discharge capacity must be at least 120,000 BTU/h
- The pressure relief valve needs to be rated for a maximum of 150 psi (1 MPa).
- The discharge piping for the pressure relief valve must be directed so that the hot water cannot splash on anyone or on nearby equipment. Follow local codes.
- Attach the discharge tube to the pressure relief valve and run the end of the tube to within 6 inches (152 mm) from the floor. This discharge tube must allow free and complete drainage without any restrictions.
- If the pressure relief valve installed on the micro-boiler discharges periodically, this may be due to a defective thermal expansion tank, defective pressure relief valve, or it could be signs of internal scale build up.
- The pressure relief valve must be manually operated periodically to check for correct operation.
- No valves may be placed between the relief valve and the micro-boiler.

CONDENSATE DRAIN

- The micro-boiler does not include a built-in condensate neutralizer cartridge for reducing the pH level of condensate water. If local codes dictate that condensate must be neutralized prior to drainage, a condensate neutralizer must be installed. An accessory Neutralizer assembly is sold separately.
- In the absence of applicable local codes and regulations, the manufacturer recommends that condensate be disposed of into a standard drain. Connect a drain tube from the condensate drain port (shown below) located on the bottom of the micro-boiler to a standard drain.

Follow all code requirements of the local authority on condensate neutralizers and whether or not they are required for the installation.



Condensate drain port

-Condensate Drain Connections-

WARNING **Discharge condensate (acidic water) in accordance with all local codes and common safety practices.**

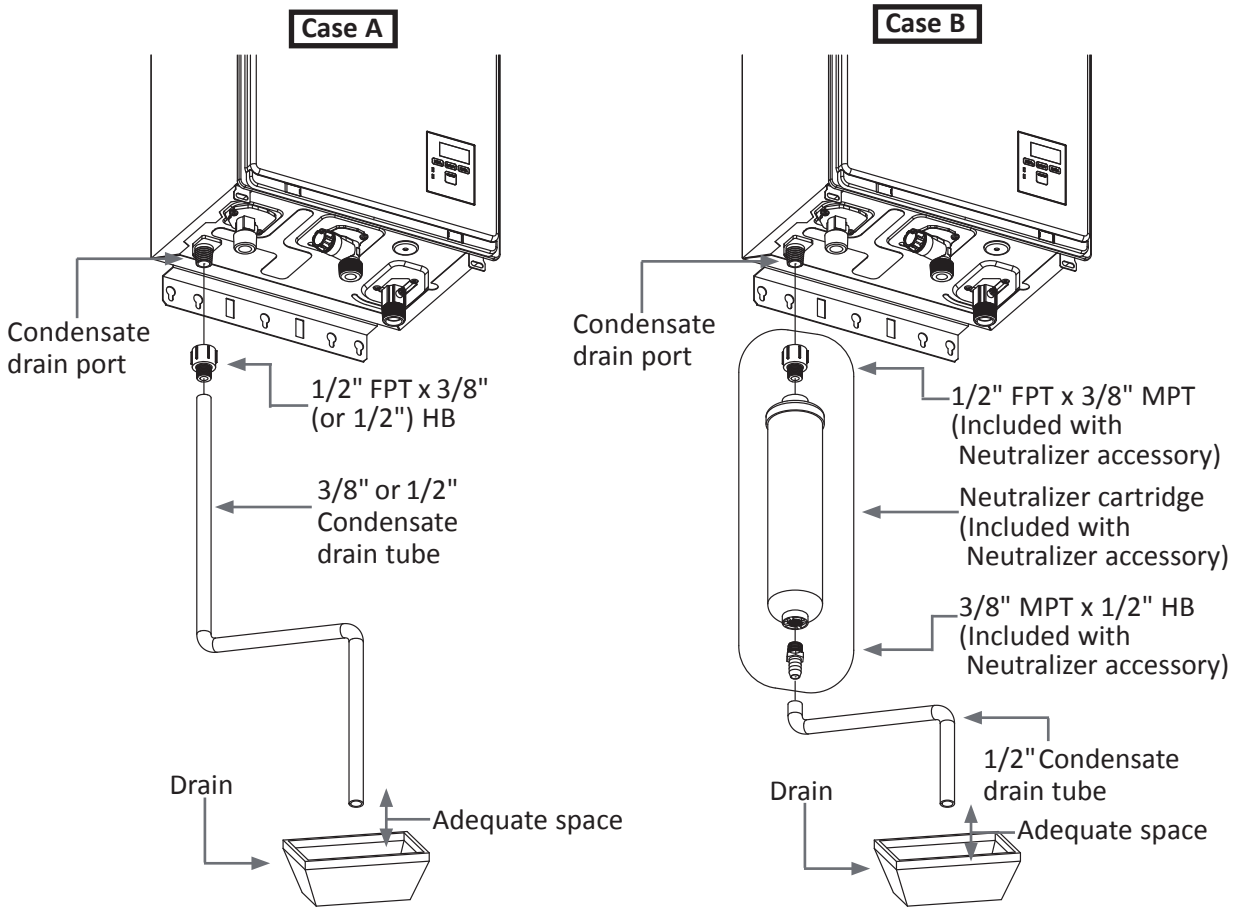
The micro-boiler is a high efficiency condensing model that produces condensate (acidic water). The acidic condensate generated in the secondary heat exchanger can be neutralized by the Neutralizer accessory.

Case A: If a neutralizer is not required

1. Connect a 1/2” FPT X 3/8” (or 1/2”) HB Adaptor to the condensate drain port at the bottom of the micro-boiler.
2. Connect a condensate drain tube to the 1/2” FPT X 3/8” (or 1/2”) HB Adaptor. The manufacturer recommends the material of the condensate tube be either EPDM or PVC.
3. Leave an adequate amount of space between the end of the drain tube and the actual drain, to facilitate proper drainage.

Case B: If a neutralizer is required (installing the Neutralizer assembly)

1. Connect the 1/2” FPT X 3/8” MPT Adaptor to the condensate drain port at the bottom of the micro-boiler.
2. Connect the Neutralizer to the 3/8” MPT connection of the adaptors. There is a flow direction indicator on the neutralizer. Please orient the neutralizer in the proper direction.
3. Connect a 1/2” drain tube to the other end of neutralizer.
4. Leave an adequate amount of space between the end of the drain tube and the actual drain, to facilitate proper drainage.


Case A
Condensate drain port
1/2" FPT x 3/8" (or 1/2") HB
3/8" or 1/2" Condensate drain tube
Drain
Adequate space
Case B
Condensate drain port
1/2" FPT x 3/8" MPT (Included with Neutralizer accessory)
Neutralizer cartridge (Included with Neutralizer accessory)
3/8" MPT x 1/2" HB (Included with Neutralizer accessory)
1/2" Condensate drain tube
Drain
Adequate space

WARNING

- The condensate drain is at atmospheric pressure (non-pressurized) and therefore must be allowed to drain freely with gravity only. Please ensure that there are no blockages along the condensate drain tube. **All portions of the condensate drain (neutralizer and drain tube) must be at a lower elevation than the micro-boiler to prevent condensate water from building up inside the heat exchanger.**
- Condensate cannot be effectively neutralized if the neutralizer elements inside the Neutralizer accessory have been completely consumed. If this happens, condensate will remain acidic and can possibly cause damage to items such as pipes, concrete, etc., if drained improperly.
- The Neutralizer cartridge is designed to last for 3 years before replacement. However, the actual life of the neutralizer may vary, depending on the application and usage. Please ensure that the cartridge is properly replaced before the neutralizer elements have been completely consumed.
- All preventative measures and safety practices must be adhered to when draining condensate. The manufacturer will not be responsible for any damage caused by condensate.
- A drain pan, or other means of protection against water damage, is required to be installed under the micro-boiler in case of leaks.

ELECTRICAL CONNECTIONS

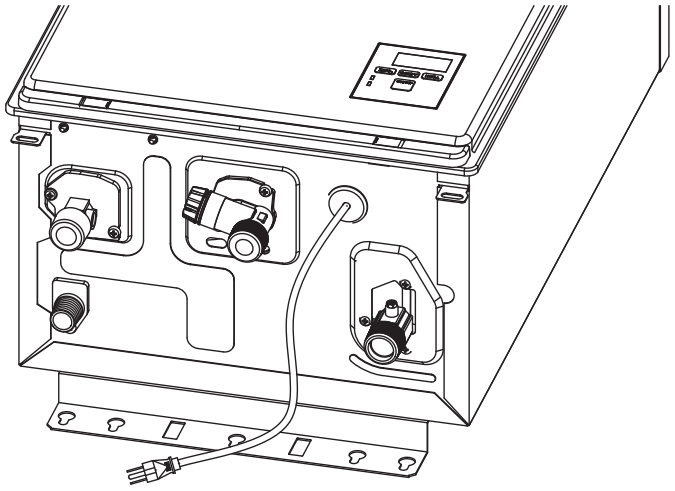
WARNING

Follow the electrical code requirements of the local authority having jurisdiction. In the absence of such requirements, follow the latest edition of the National Electrical Code ANSI/NFPA 70 in the U.S. or the latest edition of CSA C22.1 Canadian Electrical Code Part 1 in Canada.

CAUTION

When servicing or replacing parts within the micro-boiler, label all wires prior to disconnection to facilitate an easy and error-free reconnection. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.

All micro-boilers come with a power plug instead of a junction box.



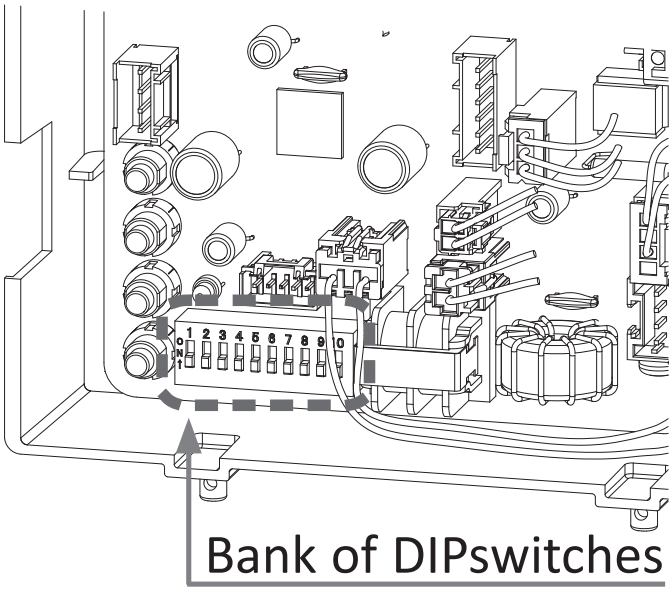
HIGH-ALTITUDE INSTALLATIONS

Check the elevation where your micro-boiler is installed. Set DIPswitches shown in the tables below depending on the altitude.

Altitude	0 to 2,000 ft. (DEFAULT)	2,000 to 3,000 ft.	3,000 to 5,000 ft.	5,000 to 7,500 ft.	7,500 to 10,100 ft.
DIPswitches					
	No. 3 : OFF No. 4 : OFF No. 5 : OFF	No. 3 : OFF No. 4 : ON No. 5 : OFF	No. 3 : OFF No. 4 : OFF No. 5 : ON	No. 3 : OFF No. 4 : ON No. 5 : ON	No. 3 : ON No. 4 : ON No. 5 : ON

NOTE: The dark squares indicate the direction the DIPswitches should be set to. Only adjust the necessary switches.

Computer board



APPLICATIONS

-Space-Heating Applications-

WARNING

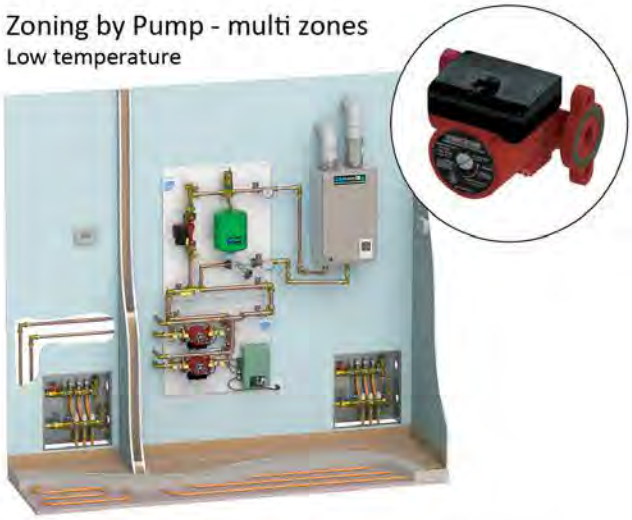
- **In order to purge air in water pipes within a closed-loop system, an air vent, air seperator, and expansion tank should be installed in the system. (Optional Hydro Smart pre-built space heating panels incorporate all these features.)**
- Water temperature over 125 °F (52 °C) can cause severe burns instantly or death from scalding.
- Chemicals such as diluted Glycol can be used for radiant floor, Hydro/fan coil air or Baseboard heating only. The diluted solution of glycol must contain between 25 and 55 % of Glycol. Be aware that in closed-loop glycol systems, low pressure in the heat exchanger can cause low-temperature boiling, resulting in excessive noise and damage to the water heater. Consult with the glycol maker for specifications prior to use.

-Hydro-Smart Pre-Built Space-Heating Panels-

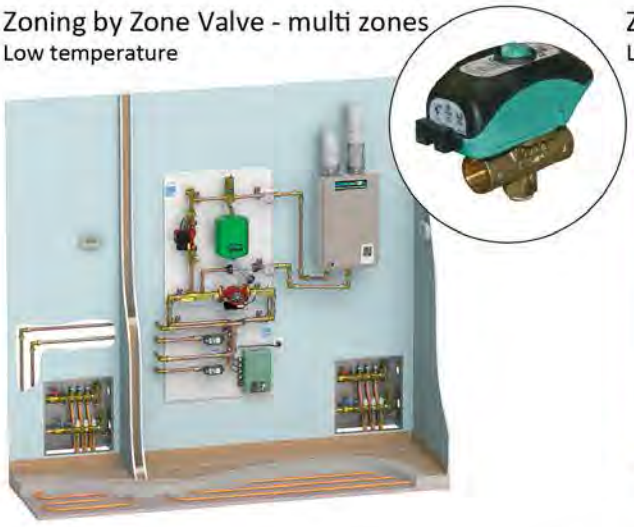
Hydro Smart pre-built panels help make space heating easy and reliable. These panels are professionally engineered and use proven primary/secondary hydronic practices. Call tech support (1-763-331-3066) for sizing assistance.

One zone interator panel
Low temperature

Zoning by Pump - multi zones
Low temperature



Zoning by Zone Valve - multi zones
Low temperature

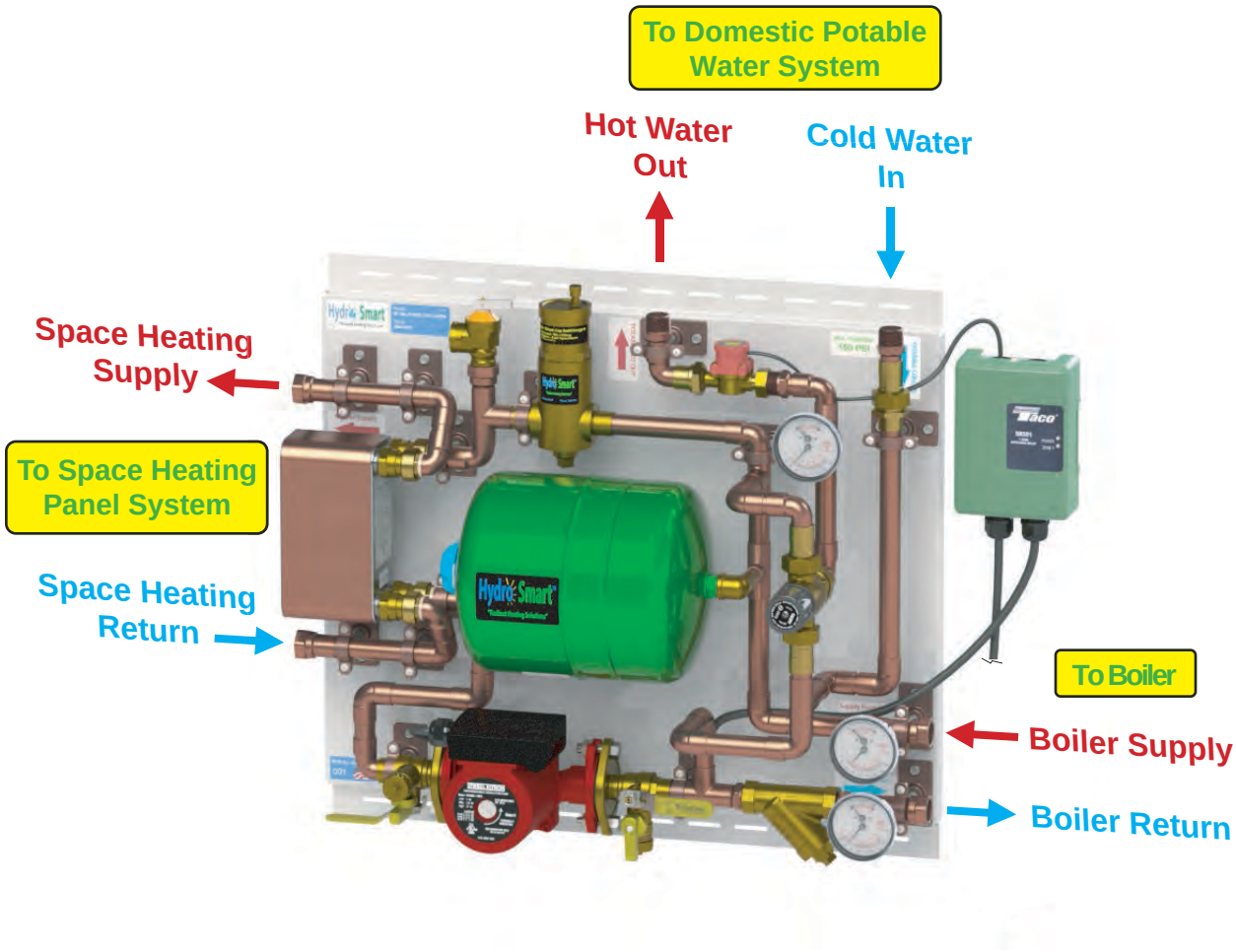


Zoning by Telestat - multi zones
Low temperature

-Dual-purpose hot water heating-

(Domestic and Space Heating):

Insert a ***Hydro Smart Dual Purpose Panel*** to provide potable heated water and Hydonic Heating with one heat source. Call tech support (1-763-331-3066) for sizing assistance.



*The **Hydro Smart Dual Purpose Panel** integrates with a wide variety of boilers and delivers "priority" potable heated water with no storage tank and hydronic space heating in a small reliable package.*

NOTICE

- Follow all local codes, or in the absence of local codes, follow the most recent edition of the National Standard Code, ANSI Z21.10.3.

INITIAL OPERATION

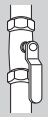
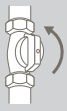
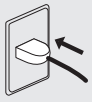
FOR YOUR SAFETY, READ BEFORE OPERATING

- **Check the GAS and WATER CONNECTIONS** for leaks before firing unit for the first time.
- Open the main gas supply valve to the micro-boiler using only your hand to avoid any spark. Never use tools. If the knob will not turn by hand, do not try to force it; call a qualified service technician. Forced repair may result in a fire or explosion due to gas leaks.
- Be sure to check for the presence of leaking gas toward the bottom of the micro-boiler because some gases are heavier than air and may settle towards the floor.
- **Check the GAS PRESSURE**. Refer to p. 20 and 22.
- Do not try to light the burner manually. It is equipped with an electronic ignition device which automatically lights the burner.
- **Check for PROPER VENTING and COMBUSTION AIR** to the micro-boiler.
- **Purge the GAS and WATER LINES** to remove any air pockets.
- Do not use this micro-boiler if any part has been submersed under water. Immediately call a qualified service technician to inspect the micro-boiler and to replace any damaged parts.

WARNING

IF YOU SMELL GAS:

- Do not try to start the micro-boiler.
- Do not touch any electric switches; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

	Operation	
1.	Once the above checks have been completed, please clean filter of any debris. Refer to p. 38 for instructions.	
2.	Fully open the manual water control valve on the water supply line.	
3.	Turn on the thermostat and verify that fluid flows through your radiant system. Then turn off your thermostat.	
4.	Fully open the manual gas control valve installed.	
5.	Turn on the 120 VAC, 60 Hz power supply to the water heater.	
6.	Now turn on the thermostat. You are ready to enjoy hours of endless comfort.	

OPTIONAL ITEMS

#	Item	Catalog #
1.	Hydro Smart Pre-built panels Single zone, pump, zone valve, and telestats	Call for order assistance
2.	4-inch Backflow Preventer	HS-2ZVB04
3.	4-inch Exhaust Sidewall Vent Terminator (Hood) and 4-inch Wall Thimble	
4.	3-inch Concentric PVC - Termination	

1. Hydro Smart pre-built space heating panels: Call tech support (1-763-331-3066) for order assistance.

Features:

- Constructed with with top quality materials, including heavy duty type L copper pipe and a powder coated panel.
- Engineered and proven panel design uses professional hydronic practices.
- With nothing extra and nothing spared on each panel, every component is there to help ensure your system provides years of trouble free operation.

2. 4-inch Backflow Preventer: TK-BF01

There are two functions available for this adaptor, which can be connected with the micro-boiler and category III venting and prevents the backflow of air through the exhaust vent. This helps prevent harmful exhaust gases from entering the home, as well as helping to prevent the micro-boiler from freezing in areas where cold air can be blown or drawn into the exhaust system. Install this adaptor in accordance with the installation instructions that are packaged with the adaptor and any applicable codes.

5. 4-inch Exhaust Sidewall Vent Terminator (Hood) and 4-inch Wall Thimble:

4-inch Exhaust Sidewall Vent Terminator (4" Wall Kit)

4-inch Wall Thimble

Description	Part#
4" Wall Vent Kit w/ Thimble (4"-7") & BF preventer	HS-2ZVWBO4
4" Wall Thimble (5"-10")	HS-2SVSWTEF04
4" Rain Cap	HS-2SVSRCF04
4" Chimney/Flat Roof Flashing	HS-2SVSSCSF04

They are used when venting out through the wall. These terminations are special stainless steel vents for gas appliances and are UL listed as Category III. For different wall thicknesses, there are two ranges of lengths available. Install these vent terminations in accordance with their installation instructions and any applicable local codes.

6. 3-inch Concentric PVC Termination: HS-CVent-3

Used when terminating direct-vent (sealed combustion) systems, with boilers that require a 3 in. (76mm) intake and a 3 in. (76 mm). This concentric termination provides the convenience of only having to make one penetration through a sidewall instead of two separate penetrations for the intake and exhaust piping. The termination includes a bird screen, restricting small animals, pests, and foreign objects from entering into the vent system.

Owner's Guide

CONGRATULATIONS

Congratulations and thank you for choosing our condensing micro-boiler. Before use, we recommend that you read through this safety manual carefully. Please refer to the back of the manual for details about the warranty. Keep this manual for future reference.

If you lose the manual, contact the manufacturer or your local distributor. When you call, please tell us the model number and the serial number of your unit written on the rating plate of the micro-boiler.

OPERATING SAFETY

FOR YOUR SAFETY READ BEFORE OPERATING

WARNING: If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

A. This micro-boiler does not have a pilot. It is equipped with an ignition device that automatically lights the burner. Do not try to light the burner by hand.

B. BEFORE OPERATING smell all around the micro-boiler area for evidence of leaking gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.
WHAT TO DO IF YOU SMELL GAS.
- Do not try to light any appliance.
- Do not touch any electric switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

C. Use only your hand to turn the gas valve knob. Never use tools. If the knob will not turn by hand, don't try to repair it. Call a qualified service technician. Forced or attempted repair may result in a fire or explosion.

D. Do not use this micro-boiler if any part has been under water. Immediately call a qualified service technician to inspect the micro-boiler and to replace any damaged parts.

OPERATING INSTRUCTIONS

1. **STOP!** Read the safety information above or in the Owner's Manual.
2. Turn off all electric power to the micro-boiler.
3. Do not attempt to light the burner by hand.
4. Turn the manual gas valve located on the outside of the unit clockwise to the OFF position.
5. Wait five (5) minutes to clear out any gas. If you then smell gas, STOP! Follow "B" in the safety information above on this label. If you don't smell gas, go to next step.
6. Turn the manual gas valve located on the outside of the unit counterclockwise to the ON position.
7. Turn on all electrical power to the micro-boiler.
8. If the micro-boiler will not operate, follow the instructions “to Turn Off Gas to Appliance" and call your service technician or gas supplier.

TO TURN OFF GAS TO APPLIANCE

1. Turn off all electric power to the micro-boiler if service is to be performed.
2. Turn the manual gas valve located on the outside of the unit clockwise to the OFF position.

DANGER

Vapors from flammable liquids will explode and catch fire causing death or severe burns.

Do not use or store flammable products such as gasoline, solvents or adhesives in the same room or area near the micro-boiler.

Keep flammable products:

1. Far away from boiler
2. In approved containers
3. Tightly closed
4. Out of children's reach

Vapors:

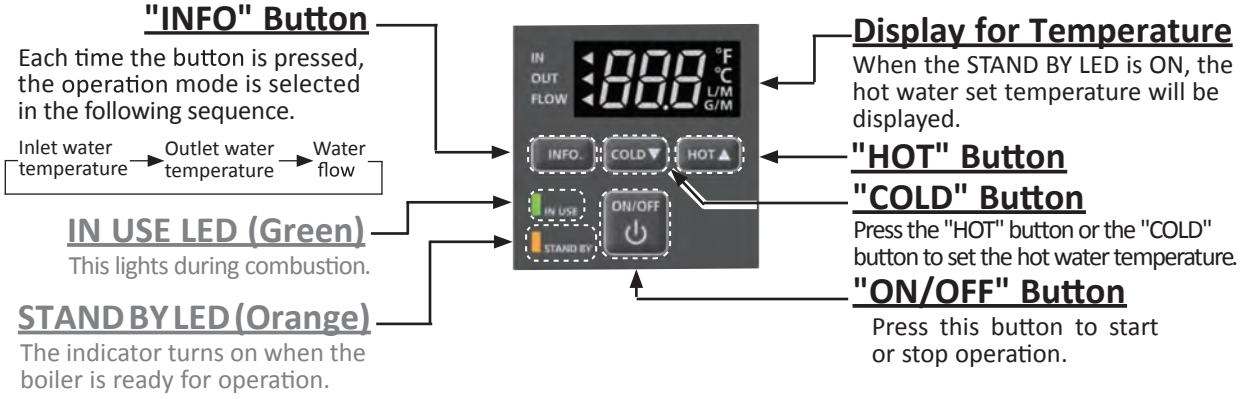
1. Cannot be seen
2. Vapors are heavier than air
3. Go a long way on the floor
4. Can be carried from other rooms to the main burner by air currents

WARNING: California Proposition 65 lists chemical substances known to the state to cause cancer, birth defects, death, serious illness or other reproductive harm. This product may contain such substances, be their origin from fuel combustion (gas, oil) or components of the product itself.

NORMAL OPERATION

DISPLAY OF THE CONTROLLER

The illustration below shows an example of the display of the controllers. The exact display may differ from examples.



GENERAL

- Flow rate to activate the micro-boiler: 0.5 gallon per minute at the default set temperature (1.9 L/min).
- Flow rate to keep the micro-boiler running: 0.4 gallon per minute (1 .5 L/min)
- The controllers have an energy saving mode. Five minutes after the micro-boiler stops operating, the backlight of the controller turns off.
- The backlight of the controller will turn back on once the micro-boiler begins firing again.

TEMPERATURE TABLE OF THE CONTROLLER

°F	100	105	110	115	120*	125	130	135	140
°C	38	40	43	45	50*	52	55	57	60

*Factory setting (Default)

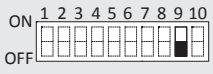
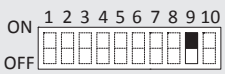
TEMPERATURE SETTINGS

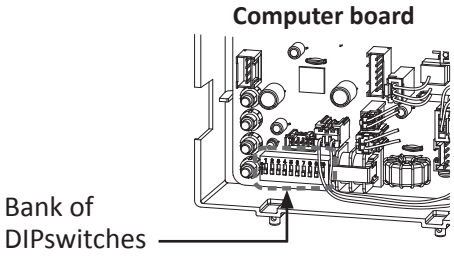
	Operation	Screen on the controller
1.	Turn on the 120 VAC power supply to the micro-boiler.	
2.	Press the **"ON/OFF"** button on the controller in order to turn the controller on.	
3.	When ON, the STAND BY LED is lit.	
4.	It shows the set temperature on its display as shown in the picture on the right. (EX.: 120 °F)	(EX.: 120 °F)
5.	Press the **"HOT"** button or the **"COLD"** button to set the temperature setting of the unit.	

-Temperature setting on the PCB-

There are 2 preset temperatures (120 °F (49 °C) and 140 °F (60 °C)) that you can select from by changing the DIPswitch settings on the computer board. See the table below. When the controller is in normal operation, the set temperature of the controller is given priority over the set temperature of the DIPswitch settings.

- The temperature has been preset at the factory to 120 °F (49 °C).

120 °F (49 °C) DEFAULT	140 °F (60 °C)
	
No. 9 : OFF	No. 9 : ON

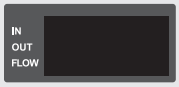


NOTE: Only change the switches with dark squares. The dark squares indicate the direction the DIPswitches should be set to.

ADDTIONAL FEATURES

-Information mode-

You can get some information about the micro-boiler condition by pressing the **"INFO"** button. For more information, follow the procedures below:

	Operation	Screen on the controller
1.	Inlet water temperature will be displayed on the controller by pressing the **"INFO"** button.	Inlet water temperature (EX.: 60 °F)
2.	Outlet water temperature will be displayed on the controller by pressing the **"INFO"** button.	Outlet water temperature (EX.: 120 °F)
3.	Water flow rate, in gpm, will be displayed on the controller by pressing the **"INFO"** button.	Water flow (EX.: 3.5 GPM)
4.	Press the **"INFO"** button to finish information mode.	

-Unit conversion mode-

The controller display information can be changed from English Units to S.I. / metric units.
Please follow the procedures below:

	Operation	Screen on the controller
1.	Press the **"ON/OFF"** button on the controller in order to turn the controller on.	
2.	When ON, the orange LED is lit.	
3.	The previous set temperature will be displayed on the screen.	(EX.: 100 °F)
4.	Press the **"INFO"** buttons for at least 3 seconds.	
5.	The set temperature should now be displayed in the alternate unit of measurement.	(EX.: 38 °C)

FLOW

- The flow rate through the micro-boiler is limited to a maximum of 7.0 GPM (26.5 L/min).
- The temperature setting, along with the return temperature of the water in the system will determine the flow rate output of the micro-boiler.

FREEZE PROTECTION SYSTEM

- This micro-boiler comes equipped with heating blocks to protect it against damage associated with freezing.
- For this freeze protection system to operate, there has to be electrical power to the micro-boiler. Damage to the heat exchanger caused by freezing temperatures due to power loss is not covered under the warranty. In cases where power losses can occur, consider the use of a backup power supply.
- The freeze protection system will activate when the freeze protection thermostat senses temperatures at 36.5 °F (2.5 °C) or lower.
- It is the installer's responsibility to be aware of freezing issues and take all preventative measures. The manufacturer will not be responsible for any damage to the heat exchanger as a result of freezing.
- In any area subject to freezing temperatures, freezing issues can occur if cold air enters through the venting into the heat exchanger by either negative pressures within the installation location or by strong outside wind. The manufacturer highly recommends the use of a backflow preventer (sold separately) to minimize the amount of cold air entering through the exhaust venting when the micro-boiler is off.
- If you will not be using your boiler for a long period of time:
  1. Completely drain the water out of the micro-boiler. Refer to p. 38.
  2. Disconnect power to your boiler.

  This will keep your micro-boiler from freezing and being damaged.

CAUTION

Only pipes within the micro-boiler are protected by the freeze protection system. Any water pipes (hot or cold) located outside the micro-boiler will not be protected. Properly protect and insulate these pipes from freezing.

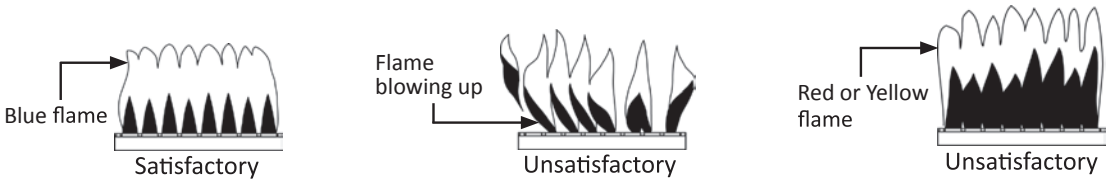
MAINTENANCE AND SERVICE

WARNING

Turn off the electrical power supply and close the manual gas shutoff valve and the manual water control valve before servicing.

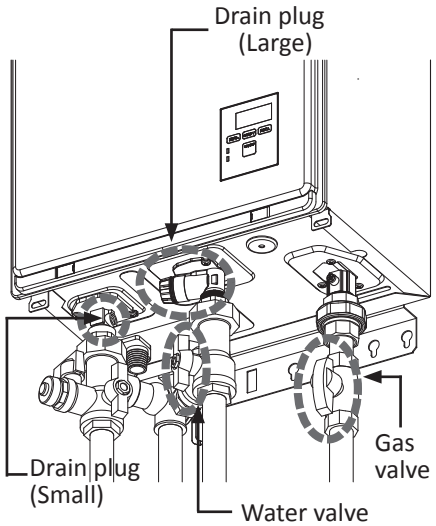
- Be sure that all openings for combustion and ventilation air are not blocked.
- The venting system should be checked annually for any leaks, corrosion, blockages or damage.
- The burner should be checked annually for dust, lint, grease or dirt.
- Keep the area around the micro-boiler clear. Remove any combustible materials, gasoline or any flammable vapors and liquids.
- In accordance with all local codes and common safety practices, water discharged from the pressure relief valve can cause severe burns instantly from scalding. DO NOT touch the pressure relief valve.
- If the relief valve discharges periodically, it may be due to thermal expansion in a closed water supply system. Contact the water supplier or local plumbing inspector on how to correct this situation.
- Visual check of burner flames (see below) through the burner window in the burner assembly located at the middle of the micro-boiler.

The manufacturer recommends having the micro-boiler checked once a year or as necessary by a licensed technician. If repairs are needed, any repairs should be done by a licensed technician.



UNIT DRAINING

1. Close the manual gas shutoff valve.
2. Turn off power to the micro-boiler and wait a couple of seconds. Turn on again.
3. Wait 30 seconds, and then turn off power to the micro-boiler, yet again.
4. Close the water shutoff valve.
5. Have a bucket or pan to catch the water from the micro-boiler's drain plugs. **Unscrew** the Small drain plug first and unscrew the Large drain plug next to drain all the water out of the micro-boiler.
6. Wait a few minutes to ensure all water has completely drained from the micro-boiler.



TROUBLESHOOTING

GENERAL

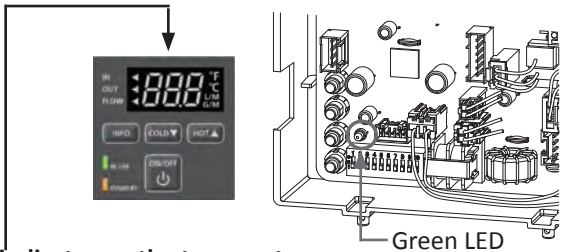
	PROBLEM	SOLUTIONS
TEMPERATURE and AMOUNT OF HOT WATER	It takes a long time to get hot water at the emitters.	• If you would like to receive hot water to your fixtures quicker, you may want to consider a hot water recirculation system. (p. 27)
	The water is not hot enough.	• Compare the flow and temperature. See the charts on p. 50. • Check cross plumbing between cold water lines and hot water lines. • Is the gas supply valve fully open? (p. 29) • Is the gas line sized properly? (p. 21) • Is the gas supply pressure sufficient? (p. 20 and 22) • Is the set temperature set too low? (p. 34 to 36)
	The water is too hot.	• Is the set temperature set too high? (p. 34 to 36)
	The hot water is not available when a there is a call for heat.	• Make sure the unit has 120 VAC, 60 Hz power supply. • Is the temperature controller power button turned on? • Is the gas supply valve fully open? (p. 29) • Is the system Y-strainer clean? • Can the emitters sufficiently draw at least 0.5 GPM (1.9 L/min) through the water heater? (p. 34) • Is the unit frozen? (p. 37) • Is there enough gas in the tank / cylinder? (For Propane model) • Is it plumbed backwards with reverse plumbing?
	The hot water turns cold and stays cold.	• Is the flow rate enough to keep the micro-boiler running? (p. 34) • Is the gas supply valve fully open? (p. 29) • Is the system Y-strainer clean? • Is the system clean of debris and obstructions?
	Fluctuation in hot water temperature.	• Is the gas line sized properly? (p. 21) • Is the supply gas pressure sufficient? (p. 20 and 22) • Check for cross connection between cold water lines and hot water lines.

	PROBLEM	SOLUTIONS
WATER HEATER	Unit does not ignite when water goes through the unit.	• Is the power on the micro-boiler? • Is the gas on? • Is the flow rate over 0.5 GPM (1.9 L/min)? (p. 34) • Is the system Y-strainer clean? • Check for reverse connection and cross connection. (p. 22) • Is the temperature controller power button turned on? (p. 34 and 35) • Check if the system return temperature is too high?
	The fan motor is still spinning after operation has stopped.	• This is normal. After operation has stopped, the fan motor keeps running from 15 to 70 seconds in order to re-ignite quickly, as well as purge all the exhaust gas out of the flue.
	Abnormal sounds from the micro-boiler.	• Is the correct gas type of a micro-boiler installed? (p. 6) • Are the DIPswitch settings for your altitude set correctly? (p. 26) • Check the flame quality. (p 38) • Is the intake or exhaust vent blocked? (p. 10) • Is the vent length and diameter correct? (p. 11 to 16) • Is the manifold pressure set correctly? (p. 4)
	Unit sounds abnormal while in operation	• Contact the manufacturer at 1-763-331-3066
Remote controller	Controller does not display anything when the power button is turned on.	• Make sure the micro-boiler is supplied with power. • Make sure the connection to the micro-boiler is correct. NOTICE: When the micro-boiler has not operated for five minutes or more, the display of the controllers turns off to conserve energy.
	An ERROR code is displayed.	• Please see p. 41 to 43.

ERROR CODES

-General-

- The micro-boiler has self-diagnostics for safety and convenience when troubleshooting.
- If there is a problem with the micro-boiler itself, or the installation of the unit, the error code will be displayed on the temperature controller.
- Consult with the table on the following pages for the description of each error code.



Error code indicator on the temperature controller

<u>Example</u>: If your unit has the "321" error code (which signifies an inlet thermistor failure)

- **Indicator on the controller :** "321" will be displayed on the screen in its entirety.

Error code

- **Green LED on the computer board:** The green LED on the computer board will be blinking two times.

-Fault Analysis of Error Codes-

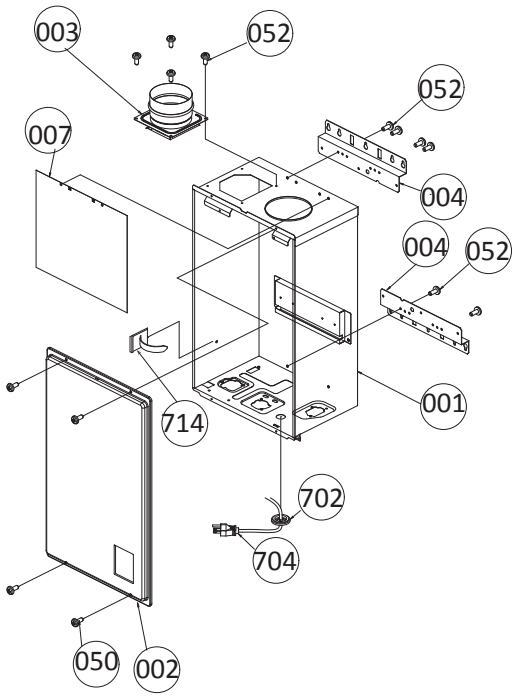
If the error code is displayed on the computer board of the micro-boiler and/or on the temperature controller, please check the following. After checking, **consult with the manufacturer**.

Display	Green LED	Malfunction description	Diagnosis
031	One Time	Incorrect DIPswitch setting	• Check the DIPswitch settings on the PCB (Part #701).
101	Five Times	Warning for the "991" error code	• Check if the gas type of the micro-boiler matches the gas supplied to it. • Check if there is any blockage in the intake air and/or exhaust. • If the micro-boiler is installed as a direct-vent system, check whether there is enough distance between the intake air terminal and the exhaust terminal. • Check the altitude/elevation of area of where the micro-boiler is installed and match the appropriate DIPswitches. • Check if there is grease and/or dirt in the burner (Part #101) and the fan motor (Part #103), especially if the micro-boiler has been installed in a contaminated area. • Check if the DIPswitches match gas type of the micro-boiler. • Check the manifold pressure at Max. and Min. • Check combustion chamber tube (Part #117) to make sure it is clear and securely installed.
111	Three Times	Ignition failure	• Check if the Hi-limit switch (Part #411) is properly functioning. • Check for connection/breakage of wires (Part #412, 707, 708, 709 710), burn marks on the computer board (Part #701), and/or soot on the flame rod (Part #108). • Check if there is a buzzing spark ignition sound coming from the burner (Part #101) when micro-boiler prepares for combustion. • Listen for the double "clunk" sound coming from gas valve assembly (Part #102) when the micro-boiler goes into combustion. • Check if there is leaking from heat exchanger (Part #401). • Check that the gas is turned on. • Check gas supply.
121	Three Times	Loss of flame	• Check if the Hi-limit switch (Part #411) is properly functioning. • Check for connection/breakage of wires (Part #412, 707, 708, 710), burn marks on the computer board (Part #701), and/or soot on the flame rod (Part #108). • Check if there is leaking from heat exchanger (Part #401). • Check gas supply.
311	Two Times	Outlet thermistor failure	• Check for connection/breakage of wires and/or debris on thermistor (Part #407, 408, 715). • Check the resistance.
321	Two Times	Inlet thermistor failure	
341	Two Times	Exhaust thermistor failure	

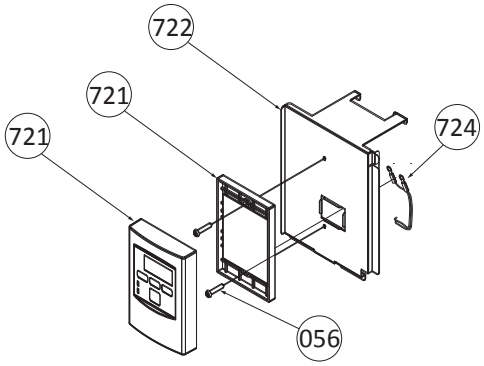
Display	Green LED	Malfunction description	Diagnosis
391	Two Times	Air-fuel ratio rod failure	• Check for connection/breakage of wires (Part #708) and/or soot on the AFR rod (Part #108).
510	Six Times	Abnormal main gas solenoid valve	• Check for connection/breakage of wires (Part #707) and/or burn marks on the computer board (Part #701). • Check for signs of vent corrosion. • Check gas valve contacts and gas valve wire harness connections for signs of rust or corrosion.
551	Six Times	Abnormal gas solenoid valve	• Check for connection/breakage of wires (Part #707) and/or burn marks on the computer board (Part #701). • Check gas valve contacts and gas valve wire harness connections for signs of rust or corrosion..
611	Four Times	Fan motor fault	• Check for connection/breakage of wires, dust buildup in the fan motor (Part #103) and/or burn marks on the computer board (Part #701). • Check for frozen/corrosion of connectors (Part #103).
701	One Time	Computer board fault	• Check for connection/breakage of wires (Part #711).
711	One Time	Gas solenoid valve drive circuit failure	• Refer to the 111 and 121 error codes.
721	Six Times	False flame detection	• Check if there is leaking from heat exchanger (Part #401).
751	N/A	Miscommunication between micro-boiler and temperature controller	• Inspect the connections between the micro-boiler and temperature controller. • Check the power supply of the micro-boiler.
941	Five Times	Abnormal exhaust temperature	• Check to see of the exhaust temperature is higher than 149°F (65°C).
991	Five Times	Imperfect combustion	• Check if the gas type of the micro-boiler matches the gas supplied to it. • Inspect the environment around the micro-boiler. Determine how long the micro-boiler has been installed and match DIPswitches. • Check the altitude/elevation of the area of where the micro-boiler is installed. • Check if there is any blockage in the intake air and/or exhaust. • If the micro-boiler is installed as a direct-vent system, check whether there is enough distance between the intake air terminal and the exhaust terminal. • Check if there is grease and/or dirt in the burner (Part #101) and the fan motor (Part #103), especially if the micro-boiler has been installed in a contaminated area • Check the DIPswitches match gas type of the micro-boiler. • Check the manifold pressure at Max. and Min. • Check combustion chamber tube (part #117) to see if it is clear and securely installed.

COMPONENTS DIAGRAM

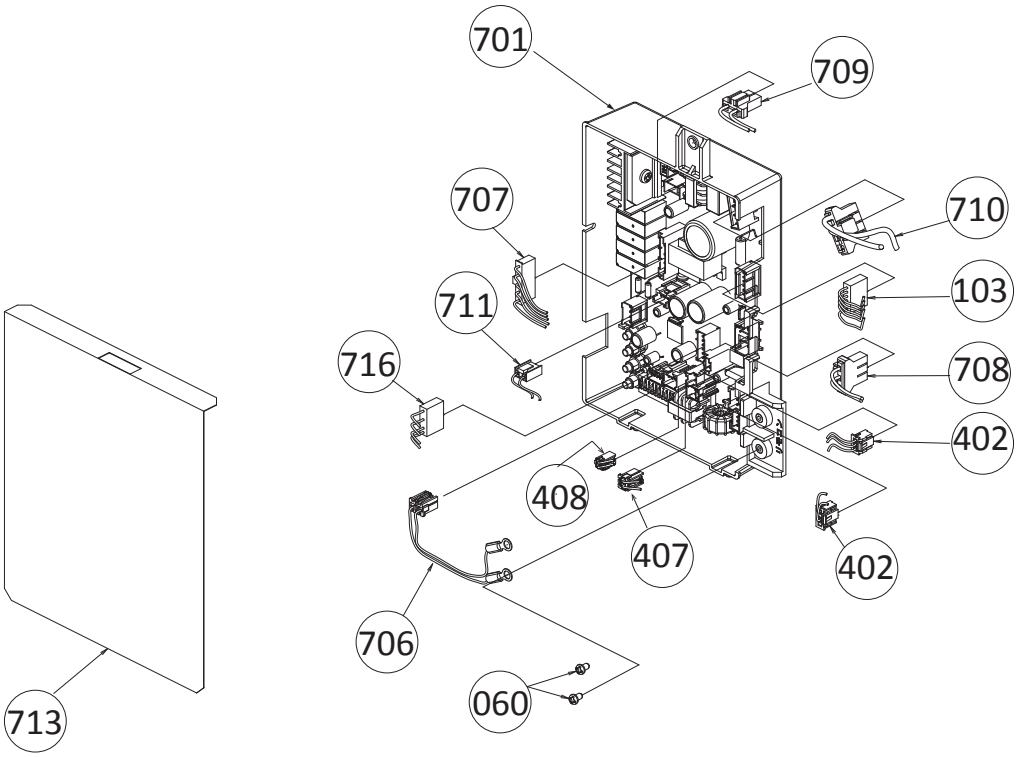
Case assembly



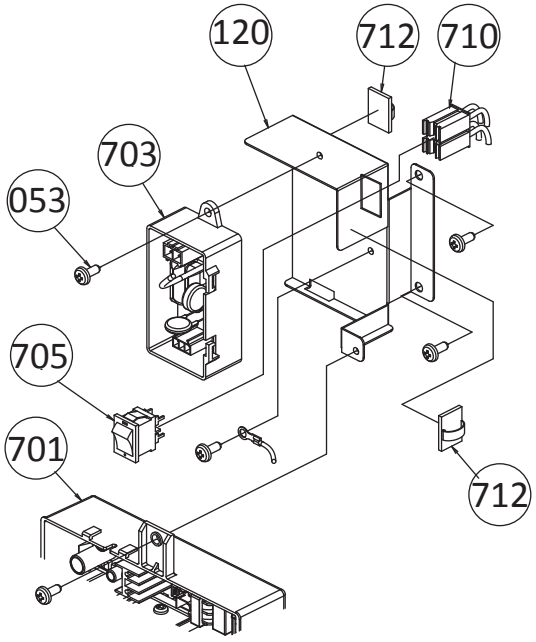
Temperature controller



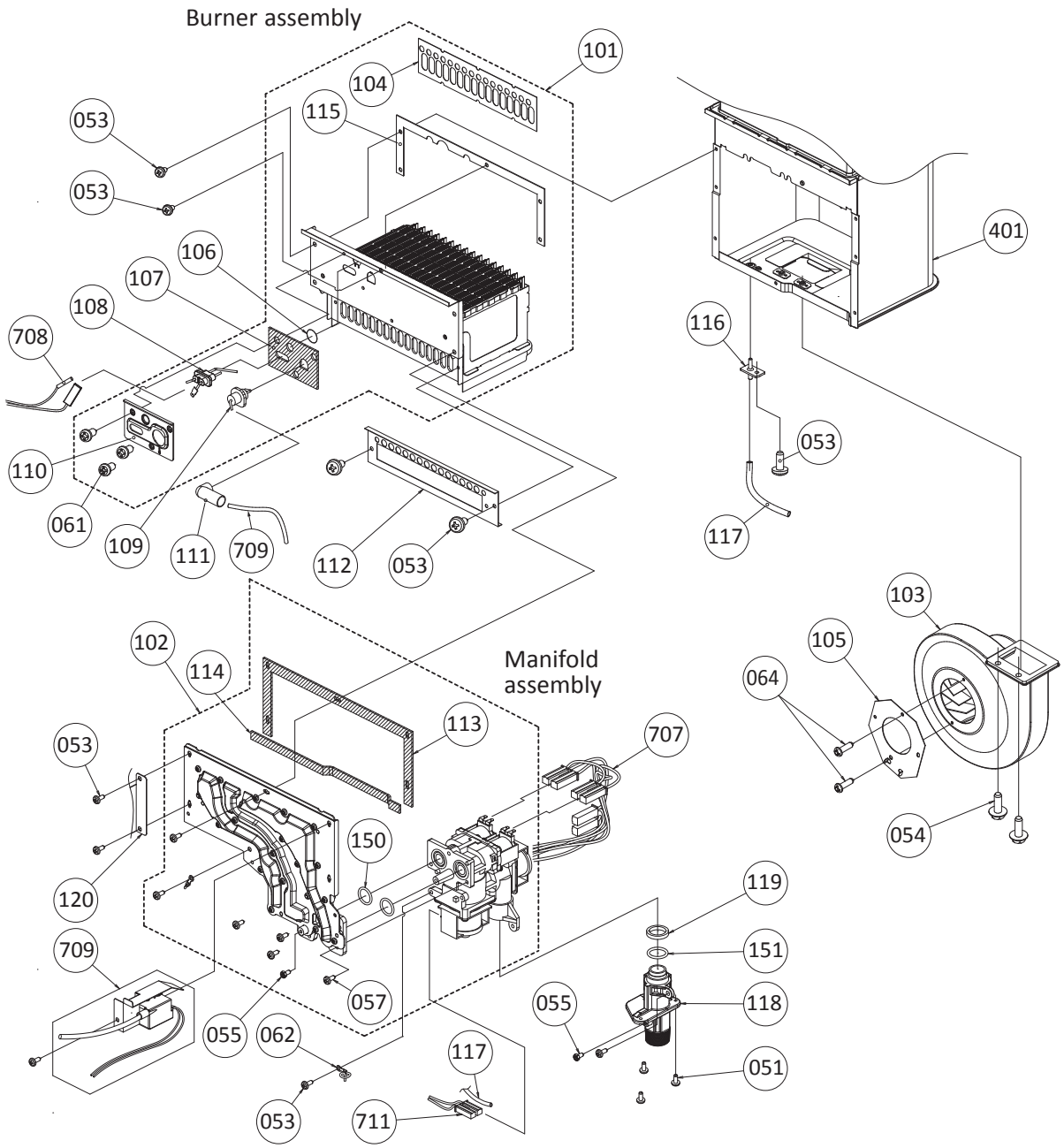
Computer board assembly



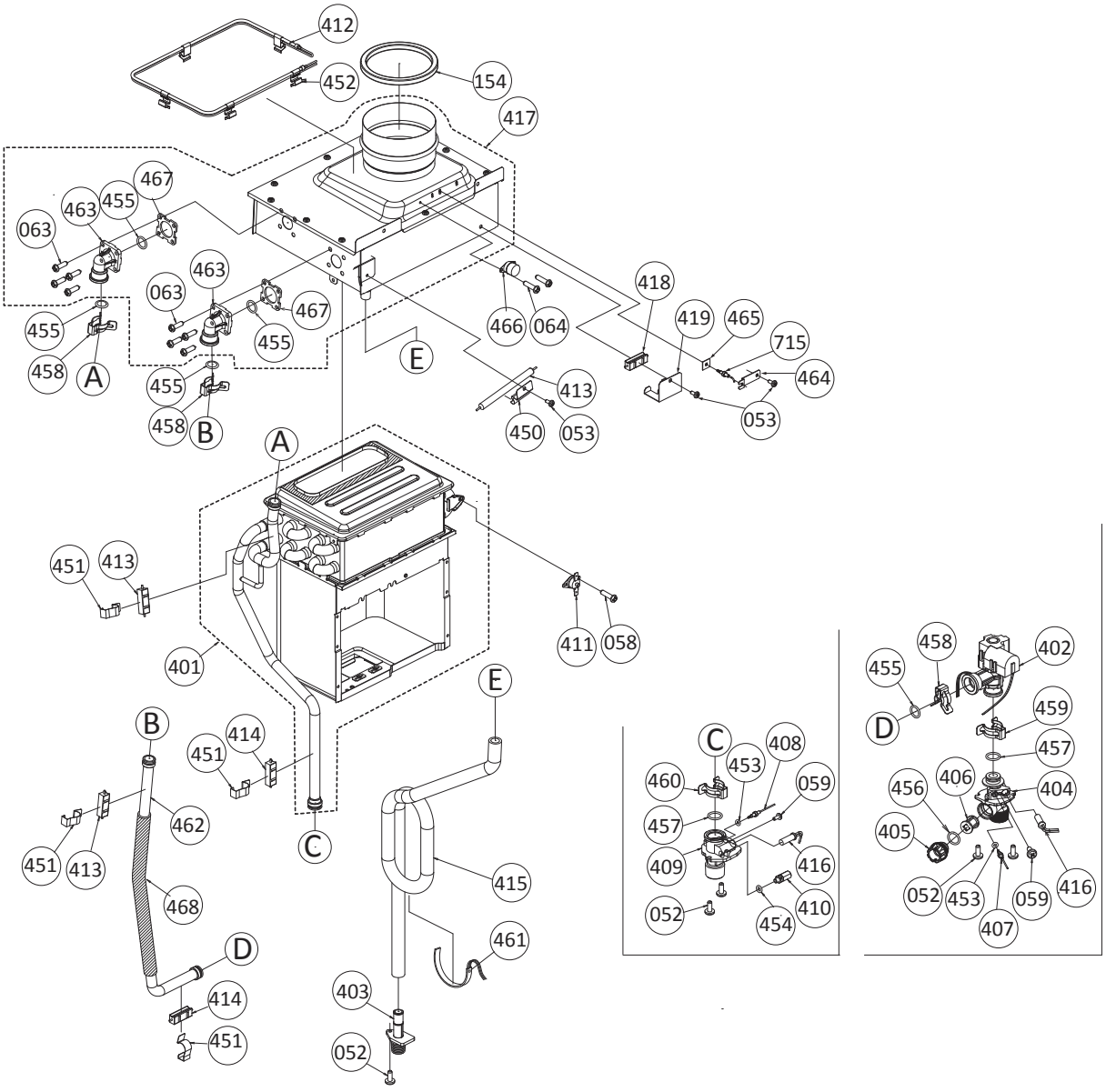
Surge box assembly



Burner assembly



Water Way assembly



PARTS LIST

Item #	Description	Part #
001	Case assembly	EK450
002	Front cover	EK452
003	Intake air port assembly	EK454
004	Bracket	EK455
005	Junction box	EK190
006	Power supply cord assembly	EK456
007	Back guard panel	EK457
050	Screw M4×12 (W/Washer)	EW000
051	Screw M4×10 (W/Washer)	EW001
052	Screw M4×10 (Coated)	EW002
053	Screw M4x10	EW003
054	Hex head screw M4×12 (W/Washer)	EW004
055	Hex head screw M4x8	EW005
056	Pan screw M4X20	EW018
057	Tap tight screw M4x12 FEZN	EKK31
058	Screw M3x6 SUS	EW00A
059	Screw M4x6	EW009
060	Screw M3x6	EK191
061	Pan screw M4x8	EW00D
062	Wire clamp 60	EM167
063	Screw M4x10	EW00P
064	Screw M3x6 SUS3	EW00B
101	Burner assembly	EK458
102	Manifold with gas valve assembly LP	EK459
	Manifold with gas valve assembly NA	EK460
103	Fan motor	EK109
104	Burner gasket	EKK2X
105	Fan damper for	EK491
106	Burner window	EKK2V
107	Rod holder gasket	EKK2W
108	Flame rod	EK193
109	Igniter rod	EK461
110	Rod holder	EKK32
111	Rod cap	EK462
112	Burner damper	EK463
113	Manifold gasket A	EKK2Y
114	Manifold gasket B	EKK2K
115	Burner holder gasket	EKK0G
116	Pressure port	EKK2D
117	Combustion chamber tube	EX019
118	Gas inlet	EK465
119	Gas inlet ring	EKK2Z
120	Surge box plate	EK466

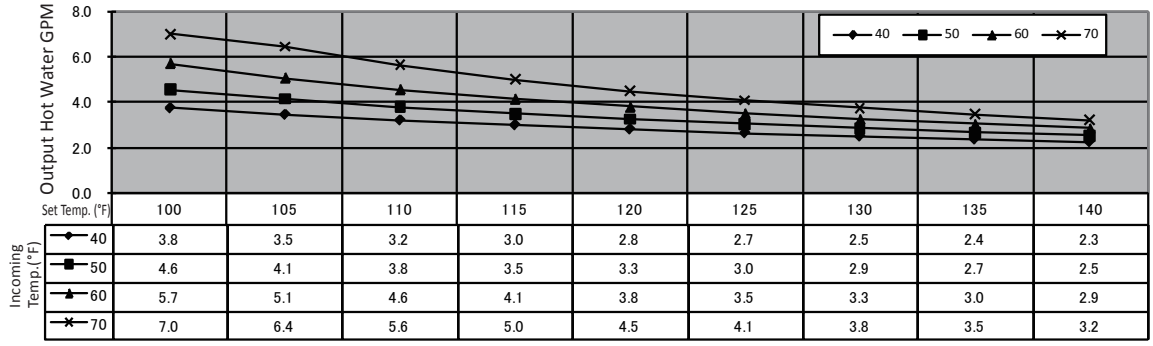
Item #	Description	Part #
150	O-ring P18 NBR (Black)	EZP18
151	O-ring P20 NBR (Black)	EK042
154	Silicon ring	EKN50
401	Heat exchanger assembly	EK467
402	Flow adjustment valve / Flow sensor	EK129
403	Condensate drain port	EKH23
404	Water inlet	EKK1U
405	Inlet drain plug	EKK2B
406	Inlet water filter	EKK2C
407	Inlet thermistor	EKK4J
408	Outlet thermistor	EK207
409	Water outlet	EK104
410	Outlet drain plug	EKK2E
411	Hi-Limit switch	EM212
412	Overheat-cut-off fuse	EX02A
413	Pipe heater	EK468
414	Inlet heater	EK469
415	Drain tube	EK470
416	Inlet heater	EK105
417	Secondary heat exchanger	EK471
418	Secondary heat exchanger heater	EK473
419	Heater fixing plate	EK474
450	Pipe heater fixing plate	EK475
451	Heater fixing plate 16	EK031
452	Fuse fixing plate	EK476
453	O-ring P4 FKM	EZF04
454	O-ring P6 FKM	EZF06
455	O-ring P14 FKM	EZF14
456	O-ring P15 FKM	EZF15
457	O-ring P16 FKM	EZF16
458	Fastener “14-22”	EKK24
459	Fastener “16A”	EM192
460	Fastener “16-25A”	EKK39
461	Flat heater	EK217
462	Cold pipe for 140 model	EK477
463	Header connection	EK478
464	Thermistor fixing plate	EX13H
465	Exhaust thermistor gasket	EX13L
466	Hi-limit switch for exhaust	EKH6G
467	Gasket	EK229
468	Inlet pipe packing	EK479

Item #	Description	Part #
701	Computer board	EK480
702	Rubber grommet	EX148
703	Surge box	EK280
704	120 VAC wire	EK146
705	120 VAC Power ON-OFF switch	EKK4V
707	Gas valve wire	EK482
708	Flame rod wire	EK483
709	Igniter assembly	EK484
710	Freeze protection thermostat	EKJ59
711	Proportional gas valve wire	EK112
712	Nylon clamp FC6	EX004
713	Computer board cover	EKK1M
714	Cable clamp	EX13C
715	Exhaust thermistor	EKH6E
716	Exhaust Hi-limit switch wire	EK180
721	Temperature controller	EK487
722	Fixing plate	EK490

OUTPUT TEMPERATURE CHART

Chart is based on properly sized gas line

Output Temperature vs. GPM (Max. 7.0 GPM) with Various Inlet Water Temperature



Incoming Temp.(°F) \ Set Temp. (°F)	100	105	110	115	120	125	130	135	140
40	3.8	3.5	3.2	3.0	2.8	2.7	2.5	2.4	2.3
50	4.6	4.1	3.8	3.5	3.3	3.0	2.9	2.7	2.5
60	5.7	5.1	4.6	4.1	3.8	3.5	3.3	3.0	2.9
70	7.0	6.4	5.6	5.0	4.5	4.1	3.8	3.5	3.2

LIMITED WARRANTY

1. The manufacturer warrants this product against defects in materials or workmanship as described in this document if installed within the United States or Canada. The manufacturer or its authorized Service Representative will, at its sole discretion, repair or replace any failed or defective mechanical or electrical parts, or components thereof, or, if the manufacturer or its authorized Service Representative cannot replace said parts, and repair is not commercially practicable, the manufacturer or its authorized Service Representative will refund the purchase price. The manufacturer or its authorized Service Representative may, at its sole discretion, use new, refurbished or reconditioned parts.

2. Warranty for all models:

[Unit: Year]

Application Type	Heat Exchanger	Parts	Labor(1)
Single Family Residential Heating	15(2)(3)	5	1
Commercial or Multi-Family Residential Heating	10(2)(3)		

(1) Limited Labor Coverage
- The manufacturer will provide for reasonable labor charges associated with warranty repairs or replacements within one (1) year from the date of purchase. The manufacturer will only pay directly to the service provider.
- Warranty service must be performed by an authorized Service Representative. A list of authorized Service Representatives is available upon request.
- All warranty claims and warranty service must be authorized and approved by the manufacturer.

(2) Includes recirculation and storage tank applications with proper circulation pump control (eg. aquastat and/ or timer).
- Lack of a proper pump control will reduce the heat exchanger and parts warranty to 3 years.

(3) In all applications, the total of length of operation time must be less than 3,000 hours for the 140 (T-H3M) model.

(4) Includes dual-purpose applications (combination heating and domestic).

3. General terms of limited warranty:
This limited warranty gives you specific legal rights, and you may also have other rights which vary from State to State. The manufacturer will honor the warranty to the original retail buyer at the original location only, within the United States or Canada, and it is not transferable.
THIS WARRANTY COVERS ONLY FAILED MECHANICAL AND ELECTRICAL PARTS DUE TO FACTORY DEFECTS UNDER NORMAL USAGE FOR THE PRODUCT'S INTENDED PURPOSES AND WITHIN THE APPLICABLE PERIOD SPECIFIED IN THE TABLES ABOVE. ONLY DIRECT DAMAGES SHALL BE RECOVERABLE BY A CLAIMANT UNDER THIS LIMITED WARRANTY AND, IN NO EVENT, WHETHER AS A RESULT OF BREACH OF CONTRACT, BREACH OF WARRANTY, TORT LIABILITY (INCLUDING NEGLIGENCE), STRICT LIABILITY, INDEMNITY OR OTHERWISE WILL BE LIABLE FOR ANY SPECIAL, INCIDENTAL, OR INDIRECT CONSEQUENTIAL DAMAGES INCLUDING PROPERTY DAMAGE, PERSONAL DAMAGES, LOSS OF USE, OR INCONVENIENCE. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

4. Limitation on Duration of Implied Warranties:
ANY IMPLIED WARRANTIES ARISING UNDER STATE LAW, INCLUDING THE IMPLIED WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE AND MERCHANTABILITY, SHALL IN NO EVENT EXTEND PAST THE EXPIRATION OF ANY WARRANTY PERIOD HEREUNDER. SOME STATES DO NO ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

5. **THIS WARRANTY WILL NOT COVER THE FOLLOWING:**
- Any product that is not installed by a licensed plumber, gas installer, or contractor.
- Damages due to accidents, abuse, misuse, improper installation, misapplication, or incorrect sizing.
- Damages due to fires, flooding, freezing, electrical surges, or any Acts of God.
- Damages due to unauthorized alterations, attachments, and/or repairs.
- Damages due to a lack of maintenance (e.g. Y-strainer, water treatment system, vent blockage, etc.).
- Any product installed in an improper environment (e.g. corrosive, dusty, chemically contaminated, excessive lint, etc.).

- Freeze damage that occurs without taking proper preventive measures as described in the installation manual.
- Condensate damage due to improperly installed or lack of a condensate trap (drain).
- Any product not installed in compliance with all applicable local & provincial codes, ordinances, and good trade practices.
- Any product sold to or installed in areas outside of the fifty states (and the District of Columbia) of the United States of America and Canada.
- Any product installed in applications that cause the micro-boiler to activate more than 300 times per day. (This averages to an activation every 5 minutes in a 24-hour period.)
- Any failures that are not due to defects in materials or workmanship (mechanical and/or electrical parts).
- Damages due to improper installation:
  - Gas: incorrect gas pipe sizing, incorrect gas meter sizing, incorrect gas type, and/or gas pressures that fall outside the product's specified range.
  - Water: incorrect water pipe sizing, water pressures that fall outside the product's specified range, recirculation flow rates that fall outside the product's specified range (air removal), and/or lack of proper methods of air removal in a closed-loop, circulation system. (See installation manual for details.)
  - Electric: supply power voltages that fall outside the product's specified range.
- Damages due to water quality:
  - Introduction of liquids other than water or water / glycol mixtures into the product.
  - Introduction of pool water, spa water, or any chemically treated water into the product.
  - Introduction of hard water measuring more than 7 grains per gallon (120 ppm) for single family domestic applications or more than 4 grains per gallon (70 ppm) for all other types of applications into the product.
  - Introduction of untreated or poorly treated well water into the product.
  - Introduction of water with pH levels less than 6.5 and greater than 8.5 into the product.